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ABSTRACT

This study of 502 private, general baccalaureate institutions examined relationships between charges for tuition and traditional measures of institutional quality (such as selectivity, reputation, financial and physical resources, curricular diversity, student-faculty ratios, library holdings, and graduate school placements). The study also tested an explanatory model of institutional effectiveness that considers the effects of finances as well as institutional characteristics, and identifies the structural elements underlying institutional performance on student outcomes (represented by an Educational Progress variable, which is a composite of freshman grade point average, sophomore retention, and graduation rates). Findings showed that consumer price was positively and significantly correlated with 27 variables representing institutional quality. Higher priced institutions generally performed better with respect to Educational Progress, though 31% of the institutions ran counter to expectations, with some of the lower priced colleges outperforming some of the higher priced colleges, and with some of the higher priced colleges showing poor performance. Certain specific institutional characteristics, especially academic enrichment programs and student activities, may be more effective than others in promoting student educational progress. Other factors, such as the percentage of full-time faculty, were found to hinder student attainment. (154 references.) (JDD)

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Price and Quality in Higher Education

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EXECUTIVE SUMMARY

Two unquestioned assumptions operate in American higher education. The first is that the quality of a college is reflected in the price it charges for tuition and fees. It is generally believed that the higher the price, the higher the quality. The second assumption is that colleges have a positive impact on their students. It is believed that the mixture of educational technologies employed by an institution makes a positive contribution to student learning and progression toward a degree. This assumption is, of course, at the very heart of what educational institutions are all about. In spite of the central nature of these assumptions, it is surprising to find that few studies have actually explored the relationships between consumer price and institutional quality. In addition, while there have been numerous studies of the institutional environment and its effect on student persistence and educational outcomes, very few researchers have taken institutional revenues and tuition charges into consideration as factors underlying institutional effectiveness. Nor have many authors sought to examine whether specific institutional characteristics and structural elements can explain institutional performance on student outcomes.

It was the purpose of this study to provide an empirical critique of the two unquestioned assumptions introduced above. The first objective of this study, therefore, was to examine the relationships between charges for tuition and traditional measures of institutional quality (such as selectivity, reputation, financial and physical resources, curricular diversity, student-faculty ratios, library holdings, and graduate school placements, to name just a few). A second objective was to test an explanatory model of institutional effectiveness that considers the effects of finances as well as institutional characteristics, and

to identify the structural elements underlying institutional performance on student outcomes (represented by an Educational Progress variable, which is a composite of freshman GPA, sophomore retention, and graduation rates).

The conceptual framework guiding this study incorporated two perspectives: (1) the economics-based organizational productivity theories, which include such concepts as efficiency, effectiveness, quality, and performance, and which provide a consideration of institutional inputs and outputs (Bowen's 1978 description of the productive process in higher education was also utilized); and (2) the theories of the social psychology of higher education, which point to the contribution of incoming student ability and the influence of the college environment on student outcomes (including Astin's 1970 input-environment-output model and Tinto's 1987 student integration theory). A review of the literature uncovered 41 key variables that have been used in past studies of institutional performance. Placing these variables in a temporal sequence dictated by the conceptual framework yielded an operationalized model of the factors hypothesized as underlying institutional effectiveness.

Data for this study were drawn from the following sources: (1) "Institutional Characteristics of Colleges and Universities, 1985-86," from the U.S. Department of Education's HEGIS XX survey; (2) "Financial Statistics of Institutions of Higher Education for Fiscal Year 1986," from HEGIS XXI; (3) "Fall Enrollment for 1985-86," from the College Board's Annual Survey of Colleges; and (4) Barron's Profiles of American Colleges (15th Edition), from Barron's Educational Services, 1986. The institutions used in this study are those classified by the National Center for Education Statistics of the U.S. Department of Education as private, general baccalaureate institutions. There are 593 such institutions

in the 1985-86 HEGIS data, and the entire universe of these institutions was used in the study.

Research to examine the first assumption concerning price and quality relationships was carried out in three steps. First, correlations between Consumer Price (each institution's published price for tuition and fees) and indicators representing institutional quality were analyzed. Next, Consumer Price and Educational Progress were plotted against each other in order to get a graphical display of their general relationship. For the last step, the institutional sample was divided in half based on Consumer Price to give high- and low-cost institutions. Then, each half was divided in half again based on high and low Educational Progress, which resulted in four price-by-performance groups. Simple descriptive statistics for selected institutional and student characteristics variables were produced for the institutions in each of the four resulting groups, and then analyzed.

The plan for examining the second assumption concerning institutional impact and performance was carried out in two steps using the institutional effectiveness model. For the first step, the composite student outcomes variable (Educational Progress) was regressed, in turn, first on 3 exogenous structural variables identified by the model, next on those 3 plus 2 stage-one endogenous variables, and last on the preceding 5 variables plus 14 stage-two endogenous variables representing the institutional environment. This yielded an initial evaluation of the net additional explanatory power provided by each successive stage of the model. The second step utilized path analysis to empirically test the causal model hypothesized to represent the underlying factors for institutional effectiveness, and to compute the direct, indirect, and total effects of each variable on Educational Progress.

The primary findings relating to the first objective are as follows. Consumer Price was found to be positively and significantly correlated with all but 2 of the 29 variables representing institutional quality (the exceptions were Faculty-Student Ratio, which was not correlated with price, and Remedial Programs, which was negatively correlated). The plot of Consumer Price with Educational Progress indicated that the higher priced institutions generally performed better with respect to Educational Progress. On the other hand, the results also indicated that 158 of the 502 institutions (31 percent) ran counter to expectations, with some of the lower priced colleges outperforming some of the higher priced colleges, and with some of the higher priced colleges showing poor performance.

Analyses of the descriptive statistics for the four institutional price-by-performance groups provided insight on the performance of institutions running counter to expectations. It was found that students at Group 3 institutions (high cost, low performance) had to bear 64 percent of their educational costs (Consumer Price divided by Expenditures Per Student) compared to only 47.6 percent for students at Group 2 institutions (low cost, high performance), and that the aid gap (Consumer Price minus Aid Per Aided Student) for students on aid at Group 3 institutions was $2,308 versus $1,603 for students on aid at institutions in Group 2. These findings reflect the fact that, although expenditures per student are nearly the same ($8,916 for Group 3 vs. $8,446 for Group 2), endowment per student at Group 3 institutions is considerably smaller than for Group 2 ($4,946 vs. $7,069), meaning that tuition must be set relatively high in order to provide the same level of quality. In addition to the "cost burden" and the "aid gap," the two groups have other significant differences, especially in regard to their allocation of resources. Group 3 institutions have, on average, $2.1 million more in buildings and equipment, yet they have

15 percent fewer library books and 33 percent fewer library journals. In spite of these differences, Group 3 institutions have an application rate that is 10 percentage points higher than Group 2 institutions, perhaps suggesting that prospective students perceive Group 3 institutions as better on the basis of price alone, or on the basis of the appearance of the campus physical plant and grounds.

The primary findings relating to the second objective are as follows. The final empirical model developed during this study used only nine independent variables, and it explained 59 percent of the variation in Educational Progress. This would seem to indicate that the model captured the key structural elements underlying institutional effectiveness. It was found that certain specific institutional characteristics, especially academic enrichment programs and student activities, may be more effective than others in promoting student educational progress. Other factors were found to hinder student attainment. The percentage of full-time faculty was, surprisingly, one such factor (at -0.13** for all institutions). This effect was especially strong at less selective institutions, indicating that a "research culture" may not be beneficial to low-ability students.

Analyses of the causal model revealed that the largest effects appear to come from institutional decisions regarding initial inputs, including decisions setting tuition levels, admissions standards, institutional size, and policies regarding at-risk students. The percentage of at-risk students at an institution had an effect on student outcomes over and above the effect of student ability levels. That is, students in at-risk categories had poorer educational progress than others even when controlling for incoming student ability. Consumer Price also remained significant even after controlling for the effects of other factors and its contribution to total revenues.

Computation of indirect and total effects using path analysis revealed several significant differences from the more common measurement of effects using multiple regression analysis. Much of the past research and literature on student persistence and retention has focused on the negative impact that larger institutional size has on student academic progress. However, when financial variables were added in and indirect effects were examined, quite a different picture emerged. In particular, a -0.24** negative direct effect of Institutional Size was almost completely offset by a +0.23 sum from the indirect effects of size. Computation of total effects for the other variables indicated that Student Ability had the strongest effect (at +0.39), followed closely by Consumer Price (at +0.38) and by Total Revenues (at +0.22). Other significant variables were Enrichment Programs (+0.12) and Activity Programs (+0.11). Significant negative effects were from At-Risk Students (-0.31), Percent Full-Time Faculty (-0.14), and Student Housing (-0.08).

Conclusions from this study address both of the initial assumptions that were of interest. First, the results seem to support two rather contradictory statements made about the relationship between price and institutional quality. That is, while it may be that "you get what you pay for," one could also conclude that "it pays to shop around." The importance of these findings to students and their parents is clear: while, for the most part, they can be confident that higher prices do reflect higher quality, they would be well advised to inquire into an institution's total financial picture and performance on student outcomes before drawing any conclusions about educational value. Institutional and governmental policy makers might find these results worth taking into consideration as well, especially in terms of measuring institutional performance and accountability.

The findings also suggest one possible basis for the apparent differences in institutional performance. That is, the more expensive colleges, even with the greater amount of student financial aid they can afford, are still out of reach for less affluent students. Students who must live at home and commute, or go to school part time while working, simply cannot afford the higher tuition and fees because of the "aid gap." Older students (perhaps financially independent) and students from minority backgrounds also have a more difficult time affording high tuition, and they tend to congregate in the less expensive colleges as well. These colleges, in turn, not only have less revenues to spend on quality improvements generally, but they must spend a larger amount of their limited resources providing more student aid and remedial services. These findings also have implications for both institutional and government policymakers.

In addition, the fact that many students and their families do seem to be influenced by a college's physical appearance and price tag may lend support (for better or worse) to the decisions made at some campuses to raise tuition prices higher than the inflation rate. Such a strategy not only seems to be effective for recruitment, it also pays off in actual revenue enhancements.

Turning to the test of the explanatory model, the identification of several factors underlying institutional effectiveness may help institutional policymakers design more effective learning environments and help them allocate resources more efficiently. However, the results caution administrators that not all academic characteristics are beneficial for all colleges (for example, placing an emphasis on full-time faculty involved with research may not promote student retention and progression toward a degree, especially at institutions with underprepared or nontraditional students).

The finding that a higher price has a direct effect on student educational attainment over and above its contribution to total revenues and what those revenues may buy indicates that price alone is a factor in student outcomes. This suggests that psychological considerations may play a larger role in student persistence than previously believed. Student goal achievement (such as college graduation) may at least be partially explained by the amount of investment (money, in this case) put into it.

One of the most important findings--that the At-Risk Students variable remained significant even after controlling for student ability--seems to indicate that at-risk students are not necessarily at risk just because they might be underprepared. Older, part-time, and minority students show less educational progress even when their ability level is the same as traditional students. This suggests that institutional factors may play a more important role than thought in the retention and graduation rates of at-risk students.

Last, the results indicate that the wealthiest colleges have the best students, resources, and programs, whereas colleges with the lowest tuition rates attract the least qualified students. These same colleges also have the fewest resources with which to address students' needs. In summary, this study indicates that the institutional impact may be positive for the best students, and negative for those students who are the least prepared for the collegiate experience.

CHAPTER I
THE PROBLEM AND ITS BACKGROUND

Introduction

The relationships between the prices colleges charge for tuition and fees, and institutional quality are of great current interest. This is not surprising given the large national investment in higher education, the importance of advanced study in today's changing world economy, and the high hopes and expectations placed on higher education by students and their families. Government officials concerned with institutional accountability, and anxious parents wondering if they will be able to afford a college education for their children have brought the question of price-quality relationships to the forefront of public debate.

The Problem

Price-Quality Myths

Two central "myths" or unquestioned assumptions closely associated with the relationship between price and quality operate in American higher education. The first is that, for private institutions at least, the quality of a college is reflected in the price it charges for tuition and fees. It is generally believed that the higher the price, the higher the quality. The second assumption is that colleges have a positive impact on their students. The belief here is that the mixture of educational technologies employed by an institution make a positive contribution to student learning. This assumption is, of course, at the very heart of what educational institutions are all about.

Moreover, these two assumptions are related. Higher tuition translates into more revenue available to spend on better teachers, facilities, equipment, programs, and services. These, in turn, are believed to produce a better educational environment for students, which ultimately results in greater student growth and development while in college, as well as possible further education, higher lifetime earnings, and a more productive and satisfying life after college. The commonly held belief, then, is that higher tuitions and other revenues are what allow colleges to offer greater quality and to deliver better institutional performance on desired outcomes. Unquestionably, colleges and universities have a positive impact on their students, and it all takes money. It is surprising to find, however, that few studies have actually explored the relationships between consumer price (tuition and fees) and desired student outcomes, together with the institutional structures and educational technologies that help transform the one into the other. It is a question of the believed versus the known, and the gap between them.

Purpose of the Study

The purpose of this study is to provide an empirical critique of the two unquestioned assumptions operating in American higher education pertaining to the relationships between consumer price and institutional quality, both through descriptive analyses and by building and testing a theory-based conceptual model of institutional effectiveness using the universe of private liberal arts colleges in the United States.

Background of the Problem

The Socioeconomic Context

Two somewhat conflicting economic principles operating in American society are (1) you get what you pay for; and (2) it pays to shop around. Until quite recently, when it came to picking a college, the first principle was almost never challenged. Most people, especially parents searching for a college for their children, believed that the price a college charged reflected institutional quality. Many parents believed that the highest priced colleges were also the best colleges and that, conversely, colleges that charged less also delivered less. College-going decisions, therefore, consisted not only of whether or not to attend college, but of finding the best college that the family could afford. This often involved deciding if the parents could make the extra sacrifices required in order to send their children to the better, and more expensive, schools. Many parents and students still think this way.[1]

However, this attitude is changing. Tuitions have been rising faster than the national rate of inflation for nearly a decade (Evangelauf, 1987, 1988, 1989) and several well-publicized reports have criticized educational quality.[2] The concern has been raised that the price of a quality college education may be beyond the reach of most families, and it appears that many families have begun to operate more and more under the second

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[1]In fact, a Gallup poll of 1,000 people 13 to 21 years old commissioned by the Council for Advancement and Support of Education conducted between August 24 and September 7, 1988, found that 38 percent agreed that "the higher the tuition costs of a college, the better the quality of education a student will receive" (The New York Times, 1988).

[2]Gardner (1983), Study Group on the Conditions of Excellence in American Higher Education (1984), Bennett (1984), Association of American Colleges (1985), Southern Regional Education Board (1985), and Boyer (1987).

principle; bargain-hunting behavior has now become common in decisions about college. Even the popular press has capitalized on this change by publishing several reports and guides for finding educational bargains.[3] All of this has led students, parents, taxpayers, and policymakers to ask some hard questions about institutional costs. Questions related to why tuitions are going up, how institutions are spending the added revenue, the reasons behind rising costs, and where all the money is going are increasingly being raised.

College and university representatives have defended the tuition increases as necessary by pointing out that the additional revenues have been used for maintaining or improving faculty salaries and essential programs, services, and facilities in the face of severe financial pressures from a number of quarters (O'Keefe, 1987). Not everyone accepts the validity of these reasons, however, and several people have offered their own explanations. One noted economist, for example, posits a "revenue theory of costs," which states that in their pursuit of excellence, prestige, and influence, colleges raise all the money they can, and spend all that they raise, leading to the cumulative effect of ever-increasing costs (Bowen, 1980, pp. 17-20).

Cost and Quality Relationships

Unfortunately, the debate over rising tuition rates has somewhat obscured the related, and more fundamental, issue addressed by the current study: whether there is, in fact, a relationship between consumer price and institutional quality.

The Consumer's View. Parents note that costs for private colleges range from $2,245 to $18,990 and that costs for public colleges range from $2,694 to $7,464 (College

[3]For example, see Stickney (1987), "America's Best Colleges" (1987, 1988), and Henderson (1988).

Board, College Scholarship Service, 1988). In addition, popular press rankings of the nation's best institutions reveal extreme variations on several commonly accepted quality factors. For example, average freshman Scholastic Aptitude Test (SAT) scores range from 800 to 1,440 and institutional acceptance rates range from 15 percent to 98 percent. These rankings also indicate a wide range in tuition charges even for top-ranked schools varying, for example, from $3,991 to $11,880 ("America's Best Colleges," 1987). Reading these figures, parents and students might well wonder what the best educational investment would be and whether the high-priced institutions are really worth several times the price of the low-cost colleges.[4]

Questioning Economic Assumptions. What really is being questioned is which of the economic principles reviewed earlier hold true for higher education. Even though most people still believe that "you get what you pay for," this basic assumption has not been explored by any recent research. It would be most convenient if someone could ascertain whether students get proportionately greater educational quality at higher priced schools than at lower priced schools, or whether the educational outcomes of similarly priced institutions were roughly equivalent. However, the answers to these questions are more elusive than the simple ratings offered by popular magazines. Measuring "educational value" is much more complex than those comparisons of tuition charges, average SAT scores, acceptance rates, and graduate school placements.

[4]All prices listed are for tuition, fees, and room and board.

CHAPTER II
REVIEW OF THE LITERATURE

Introduction

The relationships between costs and quality can be explored from two conceptual foundations: (1) from the economic theories of productivity, which provide for a consideration of inputs and outputs; and (2) from the theories and approaches of social psychology pertaining to the impact of the college environment on student outcomes. Consequently, this chapter covers relevant material from both areas and is divided into three sections with the first two based on the productivity literature and the last one based on the college environment literature. The three sections are: (1) an overview of productivity concepts; (2) studies of productivity including those focused on singular inputs and outputs, and economics-based studies using the theory of the business firm; and (3) studies of institutional effects including those concerned with student ecology and environmental press, student change, and institutional impact on student outcomes. Actually, the first section is not a literature review but, rather, a survey of the concepts of organizational productivity. The survey lays the foundation for the sections that follow and provides a great deal of insight into the assessment of institutional effectiveness and quality in higher education.

Productivity Concepts

Chapter I outlined a growing concern over cost and quality relationships. However, one of the most persistent problems facing colleges and universities has been the difficulty of measuring and explaining the inputs to and outcomes of the educational experience.

Measuring Organizational Productivity

A study of organizational productivity, as might be undertaken for an industrial plant, usually involves measuring institutional inputs and outputs. Formally stated, "Productivity in any system (economy, organization, or individual) is the output per unit of input" (Kast and Rosenzweig, 1985, p. 644). Although the term usually refers to the output of goods or services per hour of labor, in a broader sense productivity is a "measure of efficiency in the utilization of resources" at any level (p. 644). Moreover, productivity encompasses not only the quantity of outputs, but also an element of quality; that is, a gain in the number of outputs per unit of input would not represent an increase in productivity if, at the same time, the quality of the outputs decreased.

Productivity studies in higher education can be conducted along the same lines, although they are complicated by the fact that all of the usual factors evaluated in traditional analyses of productivity--inputs, products, and quality--are hard to define and measure. An elaboration of traditional productivity factors as they relate to colleges and universities will bear this out.[5]

Institutional Inputs

The inputs into an educational institution, although complex, are the easiest to measure as they are most often expressed in quantitative terms. Inputs include capital,

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[5]For example, in a broader analysis, faculty inputs might be measured, not only in terms of the dollar value of faculty time, but also by faculty ability levels and by faculty effort. Likewise, student outputs might be measured in terms of personal satisfaction and other intangible benefits in addition to the economic benefits. However, problems with these measures include the inability to observe many inputs and the inability to quantify educational outputs, especially along quality dimensions.

labor, and equipment. The complexity derives from the fact that in higher education these inputs are generally defined in terms of educational costs--a multifaceted concept that includes institutional costs, student costs, and societal costs.

Institutional costs are usually represented as expenditures, which are further complicated by the fact that expenditures are accounted for by item category (faculty salaries, equipment, etc.) rather than by function or product (instruction, research, service, or degrees, publications, and contact hours). The result is that there is no direct "product" cost accounting in higher education, making it difficult for researchers to reconstruct functional expenditures after the fact (Bowen, 1980, pp. 7-10 and 254-66). It is difficult for researchers, who must often use aggregated data, to allocate shared costs between specific products.[6]

Student costs include the direct costs of attending college such as tuition and fees, room and board, and books and transportation. These costs are referred to as the price of college. In addition to these direct costs, there are also the indirect student costs of college, primarily opportunity costs associated with a student's foregone earnings and delayed entry into the job market.[7]

Social costs also include direct and indirect costs. Direct costs include governmental and philanthropic expenditures for institutional and student aid. The indirect costs are the

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[6]For an example of the problems encountered see To (1987).

[7]However, it must be remembered that the price a student pays does not cover the full cost of the education received, the balance of the cost being covered by other sources of institutional revenue. Moreover, over 50 percent of the students attending college receive a direct subsidy in the form of financial aid, leaving those families responsible for the net price (full price minus aid).

opportunity costs of using these resources for higher education. Once used, they are not available for other public purposes such as roads or hospitals.

Another complicating consideration in the measurement of inputs are inputs other than those measured by costs, including the personal attributes of students, faculty, and staff. These include student ability and effort, faculty energy and expertise, and staff commitment and skill, to name but a few. Intangible institutional inputs include environmental synergies and cultures that motivate and facilitate educational outcomes. Also not to be discounted are family and community support, encouragement, and expectations of success. All these inputs contribute to the educational enterprise. They also make the measurement of productivity writ large a very complex undertaking.

Institutional Outputs

Measuring outputs is even more problematical.[8] First, there are three major functions of higher education--teaching, research, and public service--and each has a different set of products.[9] Moreover, each product, however defined, may actually be many different products even within the same institution. Take, for example, the bachelor's degree. Universities may offer several different bachelor's degrees (B.A., B.S., B.F.A., etc.) and each one has a different set of graduation requirements. Even within the same college,

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[8]A full discussion of the products of higher education, and their social and individual benefits is provided by Bowen (1974, 1977).

[9]The matter of what constitutes a "product" of higher education is also in some disagreement. Some view it as learning in all its manifestations, including knowledge creation, transmittal, and preservation, and changes in people's knowledge, characteristics, and behavior. Others focus on such tangible "goods and services" as credit hours, degrees, publications, discoveries, and public contact hours. Still others consider outputs to be synonymous with such short- and long-term outcomes of education as increased lifetime earnings and job status.

a degree in one field may have a substantially different set of requirements than one in another field. In the case of student-designed majors, requirements can be different for each student. So, a bachelor's degree is not one product but many, yet it is often treated in output measurements as a unitary entity. Moreover, the degree is not so much a product itself any more than a student is a "product." Rather, it is a symbol of the attainment of a product--knowledge or learning, both cognitive and affective--that is even harder to measure. Similar complexities are involved when the "products" of research and service are examined.

An additional difficulty in measuring productivity in higher education is that different types of colleges and universities have missions that emphasize the teaching, research, and public service functions to varying degrees. Diverse missions make comparisons of outputs among institutions problematical, if not insupportable.

Institutional Quality

The measurement of quality is perhaps the most elusive of all. There are at least four general approaches to the definition of institutional quality: by outcomes, value-added, resources, and reputation and selectivity, or by some combination of these (Astin, 1982). Even where there is agreement on defining quality, great obstacles remain to measuring it, in part because many attributes are not easily quantifiable, and in part because quality, like value and worth, are largely "in the eyes of the beholder."

The measurement of quality might include an assessment of content learning in the disciplines (theories, methods, and knowledge) or the development of specified cognitive skills (such as critical and analytic thinking, the ability to synthesize material and ideas, and the ability to draw and defend conclusions). Quality measurement might also include an

evaluation of student growth resulting from the educational experience (including moral, physical, social, psychological, aesthetic, and emotional development). Or, quality might be revealed through an assessment of student outcomes, both direct and indirect, resulting from the collegiate experience (including degree attainment, further education, employment, lifetime earnings, socioeconomic status, civic involvement, personal lifestyles, and satisfaction with life).

Studies of Productivity

As indicated above, productivity studies are hampered by several difficulties in deriving appropriate indicators of inputs and outputs. In response to these difficulties, researchers have used various approaches to the study of productivity, each having its own particular weaknesses and shortcomings. The more significant studies are reviewed below.

Studies Focused on Singular Inputs and Outputs

Studies attempting to measure the productivity of education have used a spectrum of singular input and output measures including years of schooling and attendant consequences, and the production of doctorates.

Years of Schooling. The number of years of schooling (usually undifferentiated by differences in quality) has been used in a large number of studies to evaluate the consequences and performance of education. This investment-in-education approach is one aspect of human capital theory--the idea that investing in people's personal development will reap social as well as individual rewards, such as better citizenship, higher levels of production in the workplace, etc. These studies have measured the effects of years of

schooling on such things as job satisfaction, personal health (Grossman, 1973), political socialization (Niemi and Sobieszek, 1977), criminal behavior (Ehrlich, 1975), marriage and divorce (Becker, Landes, and Michael, 1977), the ability to perform complicated tasks and adopt to changing conditions (Ryan and Gross, 1943; Coleman, Katz, and Menzel, 1957; Nelson and Phelps, 1966; and Welch, 1970), and economic growth (McPherson and Schapiro, 1983).[10] The number of years of education has also been used by economists to estimate lifetime earnings and to examine occupational distributions.[11]

However, using years of schooling alone has many shortcomings for studies of institutional productivity. First, limiting an analysis to quantitative differences gives no information about the effects of qualitative differences. Second, many of the studies focusing on years of schooling have not disaggregated data by institution attended, and using years of schooling as the sole measure "likely suppresses a great deal of information since it is reasonable to expect that the economic, social and political impact of a year of schooling varies considerably depending on the particular school setting" (Schapiro, 1987, p. 12). Third, years of schooling does not control for students' native ability and other personal background factors.[12] Education alone may or may not make people more productive workers or better citizens. And fourth, labor market conditions can also affect graduates' earnings (Freeman, 1976). If there is information to be found on institutional

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[10]A complete review of this literature is provided by Michael (1982) and Haveman and Wolfe (1984).

[11]For literature reviews see Mincer (1970) and Rosen (1977). It should be pointed out that there is a massive literature on many of the topics discussed below and that, while sample studies are cited, an exhaustive listing is not required for this study.

[12]As Schapiro (1987, p. 2) points out, "Assessing output is only half of a productivity analysis...."

quality in the earnings data, it can get lost in an ocean of much more powerful forces (Skoro and Hryvniak, 1980, p. 165).

An alternative hypothesis for why higher wages are often associated with higher levels of educational attainment, or why one institution's graduates do better than another's, is that education serves as a screening system for society (Spence, 1973; Wolpin, 1977; Riley, 1979; and Weiss, 1983). That is, one principal function of education is to screen for individuals with the greatest motivation and innate ability. Colleges, through the admissions process, identify only the best academically prepared students, and institutions with the highest selectivity requirements have the best students. Differences in lifetime earnings and other outcomes may, therefore, reflect the fact that colleges merely identify the more able students rather than increase their skills. The "better" colleges may not provide a better education but, rather, may serve to identify and then "certify" the better students. The importance of this distinction is outlined by Schapiro (1987, p. 13) who states, "If education were shown to have no effect on wages once background factors were controlled for, both the human capital and screening functions of education would be discredited." Similar concerns have been expressed by Jencks (1972), Bowles and Gintis (1976), and others, not only for wage-related outcomes, but also for many of the other personal effects and gains (called "personal utility" by economists) from going to college or to a particular institution.

Doctoral Production. Two early studies (Knapp and Goodrich, 1952; and Knapp and Greenbaum, 1953), which purported to investigate the relative productivity of colleges and universities, attempted to explain the superiority of certain institutions in producing future scientists and scholars. These two studies defined productivity as the percentage of an institution's graduates who later earned doctoral degrees. While these early studies were

significant in demonstrating the fact that undergraduate colleges differ widely in the proportion of their graduates who eventually earn Ph.D.s, both failed to stress the effect of incoming student quality on institutional productivity. They also generated considerable academic controversy.

Holland (1957) pointed out that the "high productivity" colleges cited by Knapp et al., all recruited higher proportions of Merit Scholars than the "low productivity" colleges. Thistlethwaite (1959a, 1959b), on the other hand, found in a sample of 36 colleges that, even after making corrections for the ability levels of entering students, marked differences in institutional productivity remained--differences closely related to certain aspects of the college environment, or as it was called at that time, the college "press" (particularly those aspects related to faculty behavior items). Astin (1961) reexamined Thistlethwaite's colleges and found that the output rates of those 36 colleges were related to the percentage of students planning to major in the natural sciences and to the percentage aspiring to the Ph.D. In fact, Astin found that when the effect of these two additional input variables were partialed out, the correlations between college "press" and "productivity" either disappeared entirely or were considerably reduced.

Economics-Based Productivity Studies

As stated earlier, productivity can be defined as output per unit of input. Productivity can be increased by producing more output (in terms of quantity, quality, or a combination of both) with the same inputs or by producing the same output with fewer inputs. Either way, the more efficiently inputs are combined, the less costly it is to produce outputs. Productivity studies using the theories and approaches of economics, unlike many

of the early studies reviewed above, take both sides of productivity equation (inputs and outputs) into consideration, and consider a more complex set of variables.

Most of the economics-based studies of productivity have used mathematical methods to examine the relationships between institutional resources and outcomes. These studies are based on economic theories of the firm, particularly production theory and cost theory. Analyses of productivity based on production theory are usually done through the specification and testing of production function models,[13] whereas studies based on cost theory typically use unit-cost analysis.[14]

Production Function Studies. Production function studies in any industry are concerned with the development of productive capacity, allocation of resources, and production processes. The production function is intended to represent the process by which an institution transforms inputs (typically labor and capital) into outputs. In order to specify the function precisely, a researcher must be able to identify and quantify all relevant inputs and outputs, and describe their relationships in mathematical terms. The basic methodology of production function research was first applied to the "education industry" at the secondary level, and several of these studies were concerned with scholastic achievement and the "production" of education.[15]

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[13]For a relatively nontechnical presentation of this method see McGuire et al. (1988, pp. 375-77). For a thorough review of these studies, see Schapiro (1977).

[14]Such as costs per student, per credit, or per degree. Examples of this approach include James (1978), Bowen (1980), and To (1987).

[15]It must be noted here that many of the studies and approaches presented in other sections of this literature review can be viewed as variations on the basic production model. For example, the studies of student change and institutional effect on student outcomes could be formulated as production functions using the individual student as the unit of analysis. In those cases, the outputs would be student achievement (test scores) or earnings, while the inputs would be either a variety of school-related and non-school-related variables,

A representative study of this type was undertaken by Bowles (1970), who first developed a model for estimating the effects of the underlying technical processes and structural parameters on the educational production function in order to study the relationship between the inputs and outputs of schools, and to improve resource allocation in the educational sector. In an empirical implementation of his model, Bowles used input variables measuring the school environment (amount and quality of teaching services, physical facilities of the school, and length of time that the student is exposed to these inputs), variables representing environmental influences on learning outside the school (e.g., parents' educational attainment), and variables representing student ability prior to school entry. The variable Bowles employed as a measure of school output was a score on a scholastic achievement battery. The results, while very preliminary and tentative, indicated that teacher quality and the physical facilities of the school were significantly related to achievement.

There were two major shortcomings in Bowles groundbreaking research. First, he used only a single output measure. Since (as even Bowles pointed out) "schools are multiproduct firms" (p. 24), such an approach is not complete. An examination of the joint, multiple outputs of education is required; otherwise, the effects of variations in inputs on other educational outputs cannot be captured. Second, Bowles failed to adequately control for initial student ability. Nonetheless, Bowles' study made a significant contribution to production function analysis in education.

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or those relating to the investment of student time. However, since most of those studies use different theoretical frameworks and come out of disciplines and research traditions unfamiliar with production models, they are presented elsewhere.

Other studies have examined the higher education production function for instructional outputs, and for the joint production of instruction and research. A review of these studies and the various approaches used was conducted by Hopkins (1986), who came to the conclusion that the relationship between inputs and outputs in higher education is not at all well understood, and that there are serious obstacles to the complete specification and estimation of the higher education production function. Hopkins found that past efforts have failed due to the fact that researchers have not been able to "reduce the learning process to quantitative terms with a high degree of accuracy" (pp. 23-24). He also felt that further examination of "the direct relationship between instructional output, as measured by student test scores, and variables representing attributes of the student and the institution" would not be fruitful.

At least one researcher has addressed this problem through an innovative approach to the definition of outputs. McGuire (1988) uses a research university's reputation as a surrogate for output, and U.S. Government dollars obligated for research and development and either the numbers or salaries of certain classes of faculty as the input variables. Using this approach, McGuire was able to estimate the technical and allocative efficiency of 40 research universities. Although using a relatively simple approach, McGuire demonstrates that production studies can provide some valuable information to decisionmakers.

In spite of the studies cited above, the production function approach has several shortcomings when applied to education. First, many of the educational technologies are either unknown, unmeasurable, or intangible (education as art, not science), making mathematical specification of their interactions and effects impossible. Second, education institutions use multiple inputs to produce multiple outputs, many of which cannot be

expressed in terms of their monetary value (or in terms of any other single measure), making it difficult to estimate the contribution of each input to each output or the joint production of outputs from various inputs. Last, everything is expressed as either an input or an output (or as dollars allocated to various functions), which reduces much of the educational "process" to a mathematical and unrecognizable form and which makes most results meaningless to practitioners.

Unit-Cost Studies. One of the most significant studies of higher education productivity using the unit-cost approach was a longitudinal study by O'Neill (1971). In her study, O'Neill analyzed the productivity change in the higher education "industry" from academic year 1929-30 to 1966-67. O'Neill used credit hour production as the output measure. For the input measures, she used current fund expenditures in constant 1957-59 dollars and the value of tangible capital. The results of O'Neill's analyses indicated both phenomenal growth in terms of credit hour production and in terms of total student instruction costs. In short, by combining data on both outputs and inputs, O'Neill found no perceptible change in institutional productivity (real inputs used per unit of output as measured by credit hours) over a 37-year period.

In a later study, Skoro and Hryvniak (1980) built upon O'Neill's work by studying the productivity of U.S. higher education from 1967 to 1977. Duplicating O'Neill's methodology as closely as they could, Skoro and Hryvniak found a mild downward trend in output per unit of input from the late sixties to the late seventies, with a slight recovery at the end of the period. A major limitation of such analyses is that they assume outputs are homogenous and, hence, ignore all quality aspects. In addition, they generally do not control for student quality, so it is difficult to disentangle institutional and student effects.

Lastly, these studies do not include a consideration of student time in the numerical estimates of institutional productivity, due to limited data.[16]

Institutional Effects on Student Outcomes

Although a number of definitions of institutional quality have been advanced, the one with arguably the most credence holds that the highest quality institutions are those that affect the greatest positive, intellectual, and developmental change in their students, and that have the strongest impact on post-graduation student outcomes. Therefore, studies of institutional impact are central to any investigation of cost and quality relationships, and provide an explanatory dimension to the study of institutional effectiveness.[17]

The literature pertaining to institutional effects on student outcomes is based largely on the theories and methodologies of the social-psychology of education. This literature may be divided into three general areas: (1) student ecology and environmental press; (2) changes in students as a result of attending college; and (3) institutional impact on student outcomes.

Student Ecology and Environmental Press

The trend in research relating to student ecology is to view the college or university setting as an environment in which many sources of influence are brought to bear on the

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[16]What fragmentary evidence there is indicates that student time on task may have decreased, which if true, would tend to mitigate the decline in measured productivity found by Skoro and Hryvniak (1980), and could easily reverse their findings.

[17]For a comprehensive review of the literature on the impact of college on students, see Feldman and Newcomb (1969).

student. The educative influence of the classroom environment is but one aspect of the cultural milieu of the university or college. This viewpoint is apparent in such sources as Sanford (1962), Sutherland et al. (1962), Newcomb and Wilson (1966), and others. These sources tend to view the process of education in terms of the assimilation and adaptation of a student to the campus culture, and the interaction of an individual with that culture.

College Environment Studies. During the decade of the 1960s, an area of study developed in higher education in which researchers began to make attempts at systematically measuring the characteristics of college environments (Pace and McFee, 1960; Koile, Harren and Draeger, 1966). A number of different techniques and instruments were devised to measure environmental characteristics (Pace and Stern, 1958; Astin and Holland, 1961; Astin, 1962b; Nunnally, Thistlethwaite and Wolfe, 1963; Pace, 1963a, 1963b; Richards, Rand, and Rand, 1966). Through the use of these techniques and instruments, it was found that different college environments have different effects on the behavior, values, aptitudes, and career choices of students, and on the type of academic and co-curricular programs that an institution attempts to implement (Thistlethwaite, 1959b, 1960; Pace, 1960, 1962a, 1962b; Nichols, 1964; and Astin, 1965).

Student Persistence. A second major area of student ecology studies is focused on student retention and persistence to graduation. These studies attempt to identify environmental factors that might explain variations in graduation rates.

A stepwise multiple regression analysis by Wegner and Sewell (1970) showed that type of college attended explained a small but significant proportion of variance in college graduation beyond what could be accounted for by measured intelligence, rank in high school class, socioeconomic background, or level of occupational aspiration in high school.

Factors such as lower standards of success at the different institutions, greater attention given to marginal students at some schools, quality of faculty, and relationships among students were found to affect the individual's performance or satisfaction with college life, and, thus, influence his chances of graduating. While these factors were known to be related to the college environment and to the individual's interaction with it, there was no theory available at the time to explain these relationships.

A significant breakthrough in this area was the development of student integration theory. Building on Spady's work (1970, 1971), Tinto (1975, 1982, 1987) formulated a theory explaining the process that motivates individuals to leave colleges and universities before graduating. According to Tinto's student integration theory, attrition results from interaction over time between students and institutions. Basically, the theory hypothesizes that persistence is determined by the match between an individual's motivation and academic ability, and the institution's academic and social characteristics. The theory asserts that, other factors being equal, the matching between the individual's characteristics and those of the institution shape two underlying individual commitments--to the goal of college completion and to the college itself. Accordingly, the higher the goal of college completion and/or the level of institutional commitment, the greater the probability of completing college.

According to Tinto (1975), a student's goal commitment is determined by the degree to which he becomes integrated into the academic life of the institution, while a student's institutional commitment is shaped by the degree to which he becomes integrated into the social life of the institution. For Tinto (1987), the indicators of academic and social integration differ. While academic performance and interactions with faculty and staff

reflect the extent to which the student becomes integrated to the academic system of the institution, participation and satisfaction with extracurricular activities and peer-group interactions reflect the extent to which the student matches the social component of the institution.

The theory also posits that academic and social integration are affected by precollege commitment toward completing a college degree as well as precollege commitment toward investing effort, money, and time in seeking a college degree (Tinto, 1975). In this respect, the model argues that family background, individual attributes, and high-school performance determine precollege commitments. Later, the student's college experiences affect the degree and intensity of these goal and institutional commitments.

A major gap in Tinto's theory is the role of finances in shaping perceptions, commitments, and preferences. The increased concern over student costs reviewed earlier lends emphasis to this shortcoming. Another shortcoming of Tinto's theory is that it fails to indicate the underlying mechanisms that facilitate or promote social and academic integration. One is left wondering if involvement in extracurricular and peer-group activities just happens or if institutions create situations that encourage involvement. In fact, Tinto's indicators of academic and social integration present an interesting chicken-and-the-egg dilemma. Does a student's report of interactions with the faculty reflect academic integration or precede academic integration? Structural theory would suggest, just as persistence is predicated on student integration, which in turn is based on student interaction, that student interactions are facilitated by social and academic structures deliberately constructed by the institution.

Student Change

The literature in this area has focused primarily on how the collegiate experience changes students (in terms of their attitudes, beliefs, values, etc.).

Early Studies. Many of the early studies of students were single-institution studies. Some of the more noteworthy include an investigation by Newcomb (1943) of changes in Bennington students, and a comparable followup study by Newcomb et al. in 1967. Another study done at Vassar (Freedman, 1967) reported on student personality development in college.

Although single-institution studies were more common, some of the early investigations were comparative studies. In one of the earliest (and, at the time, one of the most shocking to the academic community) of these comparative studies of college impact on students, Jacob (1956) challenged the long-held notion that colleges played a significant role in changing or molding student values. Instead, his analysis of as many published and unpublished studies as he could find revealed that colleges effect change only "on the periphery of the student's character, affecting his application of values rather than the core of values themselves" (p. 6). However, Jacob did find that certain small, highly selective, liberal arts colleges had a striking effect on students. In contrast, he found that large, complex institutions, especially public colleges and universities with diverse student bodies and multiple functions, tended to have little effect on their students.

However, many of these early investigations, including both single-institution and comparative studies, "failed to take differential recruitment into account in estimating the degree of institutional impact" (Clark et al., 1972, p. 5). Students not only vary considerably in their academic ability and potential at the time of matriculation, but, and more to the

point, different colleges attract and recruit different types of students with respect to student intellectual disposition, emotional temperament, motivations, attitudes, values, goals, educability, openness to change, and potentialities for development (p. 6). Various studies over the years have well documented the differences in student characteristics and the fact that these differences vary considerably, not only among students within an institution, but, more importantly, between institutions to a significant degree (Learned and Wood, 1938; McConnell, 1960; Heist and Webster, 1960; McConnell and Heist, 1961; Farwell, Warren, and McConnell, 1962; Trent, 1964; Trent and Medsker, 1968). In their extensive review of studies on college impact, Feldman and Newcomb (1969, p. 144) state that, in short,

> ...certain types of colleges are in fact predominantly peopled by certain kinds of students. Academic capacity and family background...in particular, have a great deal to do with who goes where.

Feldman and Newcomb emphasize that the "products" of a college (i.e., educated students) must be seen in relation to their incoming characteristics.

Later Studies. In a major, multilevel[18] study of the effects of college on students, Astin (1977) showed that students change in many ways after they enter college, and that much of this change can be directly attributable to the impact of going to college, quite apart from changes due to maturation or changes in the larger society.

Astin found that not all students change in the same way, and that differential change is evident according to several student input characteristics: sex, race, ability, and age. However, the major finding of his study having clear policy and administrative implications was that student involvement or "connectedness" with the institutional environment had the greatest effect on student change and persistence to degree. Factors

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[18]Defined as using both individual- and institutional-level data.

Astin found for increased involvement included dormitory living, participation in honors programs, undergraduate research participation, membership in social fraternities and sororities, academic involvement, student-faculty interaction, athletic involvement, and involvement in student government. Also, higher institutional selectivity was found to accelerate some of the attitudinal and personality changes attributable to the college experience, while smaller institutional size was found to be associated with greater involvement in campus life. All of these factors point to the importance of institutional characteristics and structural attributes to the achievement of student outcomes.

Institutional Impact on Outcomes

The literature in this area has focused primarily on how the collegiate experience affects the achievement of students' immediate personal goals (e.g., receiving a degree, going on to graduate school, or finding a spouse during college). Some studies have also examined the collegiate effect on such long-term educational outcomes as increased lifetime earnings or satisfaction with life. Unlike the output studies reviewed in an earlier section, this literature has recognized the need to control for initial student abilities and characteristics.

Ph.D. Production Revisited. That there was a real need for a study of institutional effects on student outcomes "which takes into account differences among institutions in their student inputs" (Astin, 1962a, p. 129) was demonstrated in studies by Astin and Holland (1961, 1962) that showed that much of what was called the college "press" could be predicted from a knowledge of certain personal and intellectual characteristics of the students enrolling at an institution, and that students' intelligence, sex, and choice of undergraduate major field affected the probability of their eventually obtaining the Ph.D.

In 1962, Astin corrected several shortcomings of earlier research designs by comparing an institution's output rate (the proportion of students eventually obtaining Ph.D.s) with an input measure expressed in equivalent units (the expected proportion of Ph.D.s), or in other words, by defining the productivity of a college as "the ratio between its actual output and its expected output" (1962a, p. 129). Using this definition and the findings of his earlier studies, Astin computed expected Ph.D. outputs for each of 256 colleges and universities on the basis of the intelligence, sex, and major fields of their students and compared these with actual Ph.D. production for the same institutions. The major conclusion of his study was that "much of the variation among undergraduate institutions in Ph.D. output is a function of student input" (p. 131), although he did find some differences by type of institution (technological institutions were found to be overproductive; eastern men's colleges and universities were underproductive; and private institutions, whether nonsectarian, Protestant, or Catholic, tended to be much less productive than public institutions).

Even though the net institutional effect was generally small, it was significant, leading Astin to suggest that the "characteristics of different college environments may account for discrepancies between actual and expected outputs" (p. 132). However, in comparing the differences between 35 matched pairs of over- and underproductive institutions (matches were made within the same institutional types) with respect to some 25 institutional characteristics, Astin found that only 2 of the characteristics were significant ($p < .05$). Those two factors were faculty/student ratio and tuition (overproductive institutions were found to have fewer students per faculty member and to charge less tuition).

The failure of his study to find "any consistent relationships between a college's productivity and specific characteristics of its environment," together with the finding that actual Ph.D. outputs could be predicted from a knowledge of student input characteristics, led Astin to conclude that "colleges do not differ appreciably in the extent to which they stimulate their students to seek higher academic attainment or inhibit them from seeking such attainment" (p. 134).

Astin stressed the fact that his study reported on the gross influence of institutions and that it was probable that, within a given institution, intracollege influences (certain professors, student associates, particular experiences) could encourage or inhibit individual students to eventually attain the Ph.D. (p. 134). As he stated, "When the overall productivity of the institution is evaluated, these experiences could well counterbalance one another and thereby not be reflected in a gross output measure" (p. 134).[19]

Similar conclusions about the institutional effect on student outcomes were reached by Nichols (1965). In a study of personality changes of exceptionally able students, he found that, while institutions exerted a significant influence on the students, the proportion attributable to the general characteristics of the college was relatively small in comparison to what could be ascribed to events that happened prior to college entrance.

Test Scores and Earnings. Another stream of empirical studies using student-level data has focused primarily on discovering what factors might be determinates of student test

[19]This is an inherent problem with any study reporting gross or average effects for groups of students (see Nichols, 1965; Clark et al., 1972) as opposed to effects on specific individuals. Group averages can disguise individual changes, which can, in fact, be substantial but in opposite directions, thus canceling each other out when mean scores are computed. This fact is also a problem in the current study -- one that is acknowledged but intractable.

scores and future earnings; such studies have attempted to measure the personal returns to the educational investment.[20]

One general approach used in these studies has been multiple regression, with outcomes determined by a variety of student characteristics and institutional variables. Within this general framework, different input and output variables have been used in different studies, sometimes leading to contradictory results. For example, while Astin (1968) and Hartnett and Centra (1977) found no significant effects from institutional inputs and quality measures on student performance, Hartnett (1976) and McGuckin and Winkler (1979) found test scores were closely related to class size, support services, and faculty quality. Contradictory results were also found in the analyses of institutional impact on earnings. For example, based on survey data collected from students in the state of Wisconsin, Astin (1975) found college quality had no significant effect on the graduates' earnings. However, Solmon (1975) found that college quality had positive effects on earnings even if ability and occupational choices were controlled.[21]

Another study merged student- and institutional-level data. Henson (1980), following Astin's lead and using data from the Cooperative Institutional Research Program (CIRP) at UCLA, data from the U.S. Department of Education's Higher Education General Information Survey (HEGIS), and other data sets, developed about 20 college quality variables. Using hierarchical stepwise regression techniques, he found that, among

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[20]Probably the most comprehensive and judicious analysis of the investment in and consequences of American higher education, both for the individual and society, is provided by Bowen (1977).

[21]However, the sample used by Solmon (1975) was biased because it included only white males from the top half of the IQ distribution.

all college quality variables, the most consistent predictors for earnings and the likelihood of attending graduate school were selectivity (SAT scores) and average faculty salaries. He also found that selectivity and institutional prestige (variables related to screening theory) played an important role in determining men's earnings, but that for women's earnings, variables related to human capital theory (such as expenditures per student) were more important.

However, like many other studies, Henson's study lacked a guiding theoretical framework and relied only on stepwise regressions to select significant predictors. One of the problems with these kinds of studies is their limited information about institutional variables. More importantly, their empirical frameworks do not capture the structure of higher education appropriately; that is, the whole structure collapses into a few regression coefficients that show nothing about the direction or determinates of institutional impact.

In sum, previous studies on higher education effectiveness have suffered from two primary problems: (1) the difficulties of capturing collegiate characteristics and structures in an appropriate conceptual framework; and (2) the difficulties of finding a model that could estimate the college impact on student outcomes with limited existing data. What is needed is a model that can support an analysis of the inter-relationships between student, institutional, and outcome variables.

CHAPTER III
RESEARCH DESIGN

Introduction

No one really questions that the best colleges are those that have the best students, the best faculty, and all the money required to provide the best educational environment and facilities. The real question is whether institutions produce outcomes that are commensurate with their costs (Bowen, 1980, p. 168).

Conceptual Framework

The conceptual framework guiding this study incorporates the two perspectives reviewed in the last chapter: (1) the economics-based productivity theories, which include such concepts as unit cost, efficiency, effectiveness, and production, and which provide a consideration of institutional inputs and outputs; and (2) the theories of the social psychology of higher education, which point to the contributions of incoming student ability and the influence of the college environment on student outcomes. These perspectives are used to build a conceptual model of institutional effectiveness, which then guides this examination of the cost-quality myths. These perspectives are also used to explore a developing theory of structural determinism of student outcomes.[22]

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[22]See Astin (1970b); Astin (1974); Lacy (1978); and Pascarella, Ethington, and Smart (1988).

Research Questions

The research undertaken for this study is organized to provide an empirical critique of the two unquestioned assumptions, or myths, presented in Chapter I. Accordingly, the study first addresses the nature of the relationship between price[23] and quality[24] and examines whether, in fact, the quality of a college is reflected by the price it charges for tuition. Research questions pertaining to the first myth are:

(1) Are there significant correlations between consumer price and the traditional indicators of institutional quality including resources, reputation, selectivity, and student outcomes?

(2) Do all colleges follow a similar pattern with respect to consumer price and indicators of institutional quality, and if not, what institutional characteristics might account for or explain counter patterns?

The second myth, that colleges have a positive impact on their students, is examined by testing the full conceptual model of institutional effectiveness[25] and by assessing the

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[23]Price is defined as the direct consumer cost of payments for tuition and fees. Student expenditures for room and board, books, entertainment, and travel are not included, nor are indirect consumer costs such as forgone earnings, because (1) such costs are more or less the same regardless of where a student goes to college; (2) commuter students don't pay room and board charges; and (3) tuition charges are the focus of public concern and debate, not these other costs.

[24]The definition of quality encompasses most of the approaches Astin (1982) identified: institutional resources, reputation and selectivity, value added, and outcomes. In this study, however, outcome quality is restricted those outcomes pertaining to student educational progress and attainment. Also, the value-added approach is not covered because of a lack of pre- and posttest data at the institutional level (value-added assessment data on student learning between matriculation and graduation are not collected by any current national surveys).

[25]Effectiveness is defined as institutional performance on student educational progress (which encompasses student grades, retention, and graduation rates).

"institutional effect" on student educational outcomes.[26] Research questions pertaining to the second myth are:

(3) To what degree do consumer price and student ability explain institutional effectiveness, as opposed to the impact of institutional variables representing the structural components of the education production process (as suggested by the conceptual framework)?

(4) What are the significant direct, indirect, and total effects of consumer price, student ability, and institutional characteristics on student educational progress?

Methodology

Methodological Overview

Researchers have used a wide variety of methodologies in their investigations of institutional performance, as demonstrated by the literature review presented in Chapter II. Of the many methodologies available, this study uses an approach suggested by Astin (1970b, p. 441) for analyzing institutional impact, wherein the general approach is to take the institution as the unit of analysis, to use a cross-sectional (one point in time) multi-institutional design, and to use the variations in the structural and organizational characteristics of the institutions under study to analyze the impact of different college environments on student outcomes. This study modifies Astin's approach by emphasizing a consideration for the effects of consumer price and institutional finances on the institutional environment and student outcomes. Accordingly, scores for each input,

[26]Institutional effect is defined as the degree of impact due to the workings of specific institutional structures and educational technologies, after controlling for the contributions of student input variables, as suggested by the conceptual framework.

environmental, and output variable are calculated separately for each institution. These institutional scores are then analyzed using a variety of statistical techniques.

As Astin (p. 441) points out, using such institutional-level measures presents "certain interpretative difficulties because they are remote from the student and his development. From a practical standpoint, however, they are of particular importance, being more amenable to direct manipulation than are most of the measures that characterize the various environmental inventories."

Data Sources

Since doing a national study was desirable and since large national data sets containing relevant variables were available, the study proceeded as a secondary analysis using several of those data sets. Specifically, data for this study were drawn from the following four sources: (1) "Institutional Characteristics of Colleges and Universities, 1985-86," from the HEGIS XX survey (Higher Education General Information Survey) administered by the National Center for Education Statistics of the U.S. Department of Education (computer tape); (2) "Financial Statistics of Institutions of Higher Education for Fiscal Year 1986," from the HEGIS XXI survey (computer tape); (3) "Fall Enrollment for 1985-86," from the College Board's Annual Survey of Colleges (computer tape); and (4) Barron's Profiles of American Colleges (Fifteenth Edition), from Barron's Educational Services, College Division, New York, 1986 (publication).[27]

The data provided are collected through annual surveys of all colleges and universities. Essentially, the data are all institutionally self-reported although in some cases

[27]Median SAT scores and American College Testing Program Assessment (ACT) scores and median admissions ratings data were obtained from the Barron's publication.

the data are imputed.[28] Data from all four sources are for the 1985-86 academic year, the most recent year for which complete data are available.[29]

Sample

Past research has indicated that institutional size (Jacob, 1957) and type (Astin, 1962a; Wegner and Sewell, 1970) have a small but significant effect on student outcomes. This suggests that institutions selected for study should form a homogeneous group. So, to avoid comparisons between "apples and oranges," only institutions of a single type were used in the present study. The institutions used in this study are those classified by the National Center for Education Statistics (NCES) of the U.S. Department of Education as private, general baccalaureate institutions, operationally defined by NCES as:

> Institutions characterized by their primary emphasis on general undergraduate, baccalaureate-level education. They are not significantly engaged in postbaccalaureate education. Included are institutions not considered as specialized and those in which the number of post-baccalaureate degrees granted is less than 30 or in which fewer than 3 postbaccalaureate level programs are offered and which either (a) grant baccalaureate degrees in 3 or more program areas, or (b) offer a baccalaureate program in interdisciplinary studies.

There are 593 (unduplicated) private, general baccalaureate institutions in the 1985-86 HEGIS data, and the entire universe of these institutions is used in the study. While these institutions have enrollments ranging from 83 to 8,731 students, 50 percent fall into

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[28]For a complete description of the U.S. Department of Education surveys and data imputation protocols see: National Center for Education Statistics (1987, pp. 320-42).

[29]The data sets from the U.S. Department of Education and from the College Board were on computer tapes in ASCII format. Using documentation supplied by the U.S. Department of Education and the College Board, the tapes were converted into SAS data sets.

a range of 750 to 1,750 students and 85 percent fall between 250-2,250 students, making for a highly peaked and very narrow distribution curve.

Utilizing this sample of institutions has three primary advantages. First, using these institutions reduces possible objections to employing performance toward the goals of freshmen academic achievement, sophomore retention, and degree completion rates as the criteria for effectiveness. General baccalaureate institutions emphasize the teaching (as opposed to the research and public service) function of higher education institutions and, by definition, focus on the undergraduate student. Thus, they have characteristics, constituencies, and goals that are more similar than dissimilar. This lends support to intra-group comparisons based on type-specific criteria (versus universal criteria that would apply to all types of colleges and universities). The second advantage to using these institutions is that the vast majority are roughly of the same size. This increases the homogeneity of the sample and helps to control for the effects of institutional size on student outcomes. The third advantage is that general baccalaureate institutions are basically less complex, making analysis somewhat easier. As with research in many other fields, it is often best to start with less complex forms when developing theory or testing hypotheses.

Variables Used in the Study

The variables used in this study were selected on the basis of three criteria: (1) consistency with the conceptual framework; (2) consistency with the related research; and (3) availability in national data sets. The list of variables is presented in Table 1. Details on the derivation of these variables are available from the author.

Table 1. Variables Used in the Study

VARIABLE (N)	DESCRIPTION
Exogenous Variables	
Consumer Price (585)	Published charges for undergraduate tuition and fees.
Total Financial Aid (585)	Dollar amount of aid (grant, loans, work) disbursed to undergraduates.
Net Price (561)	Consumer Price minus average student aid (grant, loans, work) per FTE undergraduate.
Aid Per Aided Student (562)	Average amount of financial aid distributed to each undergraduate student on aid.
Institutional Size (585)	Total full-time and part-time undergraduate headcount enrollment.
Student Ability (573)	Median freshman SAT scores (or ACT scores converted to SAT equivalents).
Stage One Endogenous Variables	
Total Revenues (593)	Total current funds revenues.
Revenues Per Student (585)	Total revenues divided by total headcount enrollment.
E & G Expenditures (593)	Educational and general expenditures and mandatory transfers.
Total Expenditures (593)	Total current funds expenditures and mandatory transfers.
Expenditures/Student (585)	Total expenditures divided by total headcount enrollment.
Endowment Value (593)	Dollar amount of endowment assets for the fiscal year (market value).
Land Value (593)	Dollar amount of land value at end of fiscal year (book value).
Buildings value (593)	Dollar amount of buildings value at the end of the fiscal year (book value).
Equipment Value (593)	Dollar amount of equipment value at the end of the fiscal year (book value).
Percent Minority (530)	Percent of undergraduates who are minority students.
Percent Part-Time (585)	Percent of undergraduates who are part-time students.
Age Of Students (496)	The average age of undergraduate students.
Percent On Aid (562)	Percentage of undergraduate students receiving financial aid.
Percent Commuters (540)	Percent of undergraduates who commute.
At-Risk Students (459)	Sum of standardized scores for Percent Minority, Percent on Aid, Age of Students, and Percent Part-Time.
Stage Two Endogenous Variables	
Percent Faculty PhD (525)	Percent of full-time faculty holding doctoral degrees.
Percent F-T Faculty (528)	Percent of full-time faculty.
Faculty/Student Ratio (561)	The FTE faculty-student ratio.
Enrichment Programs (585)	Number of special academic enrichment programs offered (24 possible).
Remedial Programs (585)	Number of remedial services available (9 possible).
Library Books (585)	Number of library title holdings.
Library Journals (585)	Number of library periodical subscriptions.
Curricular Diversity (585)	Number of different academic majors offered (534 possible).
Activity Programs (585)	Number of student activity programs available (21 possible).
Athletic Programs (585)	Number of different athletic sports programs available (35 possible).
Athletic Facilities (585)	Number of different types of athletic facilities available (10 possible).
Student Housing (585)	Number of different housing types available (16 possible).
Student Services (585)	Number of student services available (22 possible).
ROTC Programs (585)	Number of military training programs available (4 possible).
Outcomes Variables	
Freshman GPA (566)	Percent of freshmen who complete the year in good standing.
Soph Retention (509)	Percent of freshmen who return for the sophomore year.
Graduation Rate (585)	Number of bachelor's degrees conferred divided by total headcount undergraduate enrollment.
Grad School Rate (312)	Percentage of graduates (with BA degrees) who enter graduate school.
Reputation (585)	Number of applications for admission received adjusted for institutional size.
Educational Progress (503)	Sum of standardized scores for Freshman GPA, Soph Retention, and Graduation Rate.

Operationalized Conceptual Model

Placing these 41 variables in a temporal sequence dictated by the conceptual framework yields an operationalized model of the hypothesized structural factors underlying institutional effectiveness. This operationalized model is presented below. A quick examination of this model reveals the hypothesized relationships that were tested, including:

- The hypothesized direct effects of price, size, and ability on variables representing traditional quality indicators and institutional structures. These paths indicate the contribution of the exogenous variables on endogenous variables representing the environmental structures suggested by Bowen's description of the productive process in higher education, Hochbaum's "Black Box" Model, and the variables this study advances as underlying Tinto's student integration theory.

- The hypothesized direct effects of environmental structures on outcomes. These paths indicate the direct effects the environmental variables have on student academic outcomes. These structures are hypothesized to be the causal agents underlying the effectiveness of institutional impact and performance toward goal achievement.

- The hypothesized direct effects of **Consumer Price**, **Institutional Size**, and **Student Ability** on outcomes. One path indicates the hypothesized contribution of incoming student ability on student outcomes (as in Astin's model discussed earlier). Another indicates the direct effect of price on outcomes. This hypothesized effect is built upon cognitive dissonance theory as developed by Festinger (1957).[30] A third line indicates the effect of size on outcomes.[31]

- The hypothesized indirect effects of price, size, and ability on environmental structures. These paths indicate the expected indirect contributions of price, size, and ability on the stage two endogenous environmental variables, as they are expressed through the moderating effects of other institutional characteristics (the stage one endogenous variables representing financial and student characteristics).

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[30]Festinger's theory postulates that the more effort (or money, as in the case of the present model) one has expended in pursuit of a goal, the higher is one's probability of success (other things being equal, of course).

[31]A convention utilized in this study is to capitalize and highlight the names of all operationalized variables and models whenever they are used in the text (this convention is not followed in tables or figures).

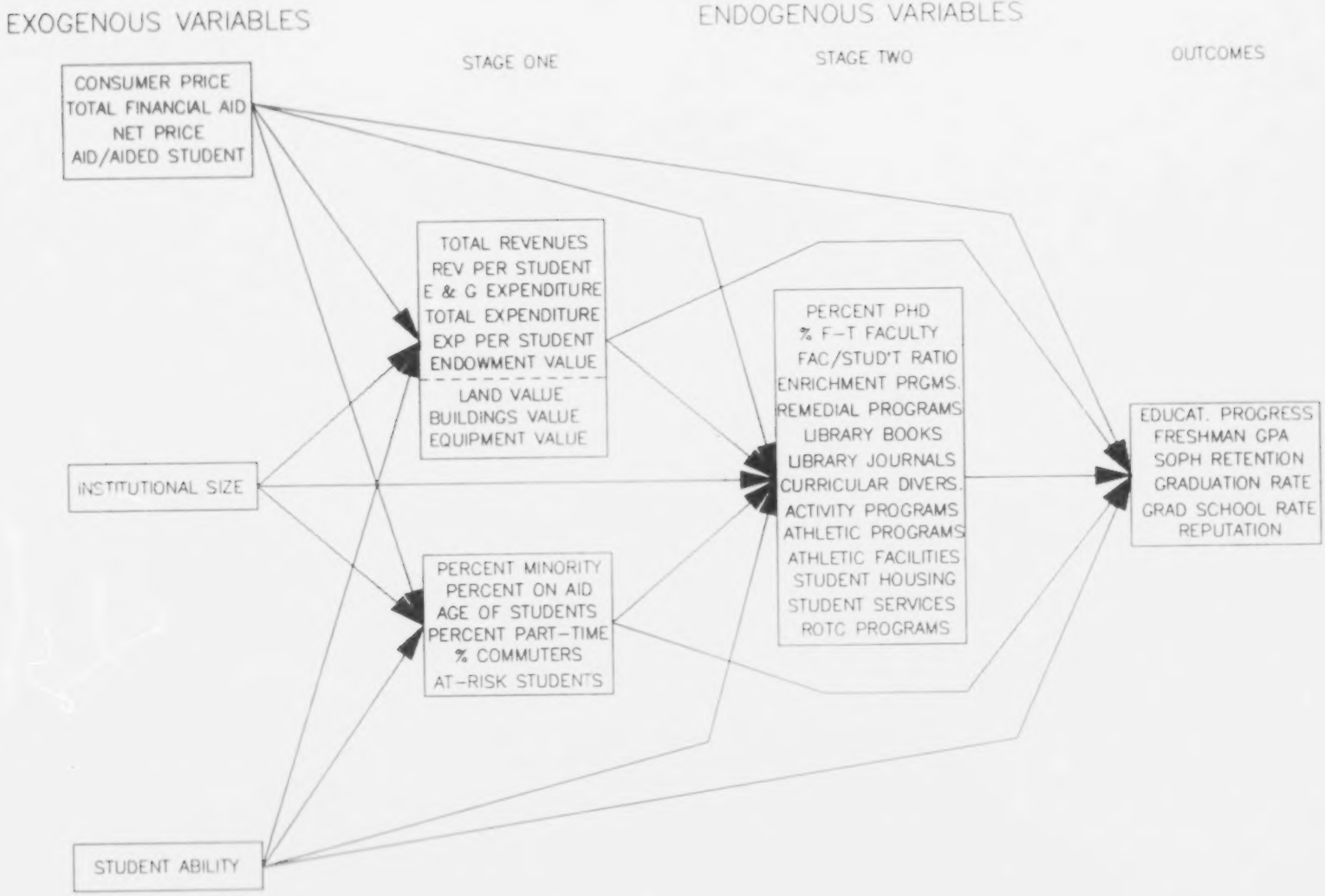

Figure 1. Operationalized Conceptual Model

Limitations of the Study

Like most studies, this study has several limitations, and they are briefly described below.

Data

The current study is limited primarily by the data available. All the data used in this study is self-reported by the institutions. It is reliable data to the degree that the institutions reported it reliably. For a discussion of the technical reliability of the HEGIS data and of possible nonsampling error, reference is made to the "Guide to Sources" by the National Center for Education Statistics (1987, pp. 320-42).

This study is also limited by the data collected. While there are certainly more institutional structures and student characteristics than those included in this study, many items could not be included in the analyses simply because data for them do not exist (at least not in national data sets). Only those variables collected in annual surveys by the College Board, Barron's, or the National Center for Education Statistics were available.

In addition, Astin (1962) pointed out a major shortcoming in using institutional-level data--data aggregation. Much of the data are averages of individual student ability, retention, and outcomes. This leads to the possibility that institutional effects may be large for many students on an individual level but in opposite directions thus canceling each other out, with the result that no institutional effect would be found. For example, since this study uses institutional-level data, not student-level data, individual drop-out and transfer patterns are not dealt with. Only institutional mean rates of persistence and graduation are used. These rates, therefore, actually reflect net retention (including transfers into each

institution and students who return after dropping out temporarily) and not the experiences of individual students.

Last, using the selected data sets does not allow for an analysis of the roles student intentions, goals, and commitment to a particular institution might play in student persistence and other academic outcomes. That they do play a role is posited by Tinto's (1987) model. Also, since these data sets are cross-sectional as opposed to longitudinal, they only reflect one time period. This means (among other things) that the effects of student movement in and out of the system (including transfer students and stop-outs) and institutional changes over the course of a college education cannot be captured by the data.

Indicators

It is not known whether the indicators used actually measure student ability, elements of the institutional environment, student outcomes, or institutional quality. Rather, they are either customarily accepted indicators of inputs, process, and outputs, or have been developed from the conceptual framework and literature review.

A related problem is the number of variables available for analysis and the number of institutional factors affecting effectiveness. The conceptual model provides a framework for identifying the underlying dimensions of institutional performance by both a priori and empirical methods, and a number of variables are associated with each dimension. Several approaches are available for representing these structural dimensions including using all associated variables in the analyses. A more practical approach would be to select a single variable to represent each dimension. Alternatively, variables could be combined through an empirical analysis of the data using principal components or other analytical techniques. The problem is that the first approach requires too many variables to be practical, while

neither of the other two methods capture the complexity and richness of environmental influences on student outcomes very well. So, this study proceeds with a combination of the best and worst of all three approaches.

Lastly, the model assumes that institutions seek to maximize performance on the selected measures, an assumption that is not empirically substantiated. These indicators and the resulting analyses, therefore, may be misleading or inappropriate to the degree that students and/or institutions may be in conscious pursuit of objectives not adequately represented by these measures. Thus, the results coming from this study should be accepted with great caution. Pursuing institutional change along any routes suggested by the results of this study could produce negative consequences for other desired outcomes.

Universe

The results of this study only apply to the institutional type used in the study (private, general baccalaureate institutions). Even then, there is no way to establish a truly homogenous peer group. Such major factors as institutional mission, location, and history create unique environments and approaches to the educational process. Therefore, great caution must be exercised in applying the results of this study to decisionmaking at the institutional level.

Some Concerns About the Current Study

Although this study is a limited exploration of college effectiveness, it is difficult to pursue this line of inquiry without becoming embroiled in some long-standing controversies over the appropriateness of applying concepts of inputs, outputs, and production processes to education. There are those who insist that universities do not "produce" anything, that

students are not "products" any more than degrees are, and that a university is not an assembly line to be measured, manipulated, and made efficient.[32] To such observers of higher education, this study is in error from the start, because, if there is no output of colleges and no production transformation, it does not make any sense to speculate on the effectiveness with which these processes are conducted or on the relationships between inputs and outputs.[33]

By way of an answer, it is clear that this study is squarely in the mainstream of approaches to the study of institutional effectiveness. Moreover, the research design addresses many of the concerns about using the outputs and goal accomplishment approach. But perhaps most importantly, it is necessary only to point out the fact that students will make their choices, and policymakers will make their decisions, with or without this study. That these choices and decisions would be better, were they based on some theoretically grounded and empirically tested findings rather than on some unexplored assumptions, seems to provide an obvious and compelling justification for this study.

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[32]See, for example, Bowen and Douglass (1971, pp. 2-4) and Astin (1974, p. 39).

[33]This issue is clearly laid out by McGuire et al. (1988, pp. 366-67), whose comments have been borrowed and adopted here.

CHAPTER IV
FINDINGS

Introduction

This chapter presents the results of the analyses undertaken to answer the research questions posed by the current study. The results are organized into two parts corresponding to the two "myths" discussed in Chapter I. That is, the results from the first two research questions addressing the price-quality myth are presented, followed by the results from the last two research questions addressing the institutional impact myth. A discussion of the implications of the findings is the subject of Chapter V.

Results: Part One

The first two research questions were designed to address the issue of whether the quality of a college is reflected in the price it charges for tuition and fees. In order to answer these questions, the analyses that were performed explore the relationships between cost and quality and the nature of those relationships.

Question One: Price-Quality Correlations

The first research question asked, "Is there a significant correlation between consumer price and such indicators of institutional quality as resources, reputation, selectivity, and student outcomes?" To answer that question, correlations were run between price and indicators for each quality dimension. The results of those correlations are presented in Table 2.

Price and the Quality of Resources. Correlations between **Consumer Price** and variables representing financial resources, physical resources, academic resources, and the number of student services and facilities were examined first.

As can be seen from the results presented in the correlation matrix, **Consumer Price** is positively correlated with all the variables representing financial resources, ranging from .48 with **Endowment Value** to .63 with **Revenue Per Student**. **Consumer Price** is also positively correlated with the three physical resources variables. As the matrix shows, the correlation between **Consumer Price** and **Buildings Value** is .59 while correlations with the other two physical resources indicators are lower but still positive and significant (.39 with **Equipment Value** and .25 with **Land Value**).

The correlations between **Consumer Price** and the variables representing academic resources are somewhat mixed. The highest correlations are between **Consumer Price** and **Library Books**, **Enrichment Programs**, and **Percent PhD** (at .54, .52, and .40, respectively). Moderate positive correlations are found between **Consumer Price** and **Percent Full-Time Faculty** (at .29), **Curricular Diversity** (at .18), and **Library Journals** (at .15). Unlike the other relationships, the correlation between **Consumer Price** and **Remedial Programs** is negative (at -0.18). This may be due to the fact that higher priced institutions attract students with higher ability requiring fewer remedial programs. The only academic quality variable not correlated with **Consumer Price** is **Faculty/Student Ratio** (at 0.03 with $p = .50$, which is not significant).

The next set of correlations examined were the relationships between **Consumer Price** and the number of student service programs and facilities. As can be seen by the matrix results, price is positively and significantly related to the quantity of student services.

Table 2. Correlation Matrix

	EXOGENOUS VARIABLES			STAGE ONE ENDOGENOUS VARIABLES										STAGE TWO VARIABLES		
VARIABLES (no. of observations)	CONSUM PRICE	SIZE	ABIL-ITY	TOTAL REVENU	REV P/ STUD'T	E & G EXPEND	TOTAL EXPEND	EXPEND STUD'T	ENDOW VALUE	LAND VALUE	BUILD VALUE	EQUIP VALUE	AT-RISK	% PHD	% F/T FAC	F/STU RATIO
CONSUMER PRICE (585)	1.00	.05	.66**	.56**	.63**	.54**	.55**	.62**	.48**	.25**	.59**	.39**	-.55**	.40**	.29**	.03
COLLEGE SIZE (585)		1.00	.15**	.62**	-.19**	.68**	.64**	-.23**	.13**	.35**	.42**	.44**	.03	-.04	-.12**	-.20**
STUDENT ABILITY (573)			1.00	.51**	.49**	.50**	.50**	.48**	.52**	.27**	.56**	.42**	-.55**	.36**	.30**	.02
TOTAL REVENUES (593)				1.00	.49**	.98**	.99**	.44**	.67**	.54**	.87**	.76**	-.39**	.29**	.27**	-.10*
REVENUE/STUDENT (585)					1.00	.43**	.46**	.98**	.61**	.26**	.49**	.36**	-.46**	.36**	.41**	.20**
E&G EXPENDITURES (593)						1.00	.99**	.40**	.63**	.53**	.83**	.72**	-.34**	.27**	.24**	-.11**
TOTAL EXPEND (593)							1.00	.43**	.65**	.54**	.87**	.75**	-.37**	.29**	.28**	-.11**
EXPEND/STUDENT (585)								1.00	.57**	.23**	.45**	.32**	-.45**	.35**	.42**	.19**
ENDOWMENT VALUE (593)									1.00	.27**	.69**	.56**	-.35**	.31**	.28**	.02
LAND VALUE (593)										1.00	.45**	.46**	-.20**	.19**	.14**	-.05
BUILDINGS VALUE (593)											1.00	.75**	-.43**	.36**	.35**	-.10*
EQUIPMENT VALUE (593)												1.00	-.33**	.23**	.27**	-.11**
AT-RISK STUDENTS (459)													1.00	-.28**	-.37**	-.07
PERCENT PHD'S (525)														1.00	.18**	-.07
% F-T FACULTY (528)															1.00	-.01
FAC/STU RATIO (561)																1.00
ENRICH PROGRAMS (585)																
REMEDIAL PROGRAMS(585)																
LIBRARY BOOKS (585)																
LIBRARY JOURNALS (585)																
CURRIC DIVERSITY (585)																
ACTIVITY PROGRAMS(585)																
ATHLETIC PROGRAMS(585)																
ATHLETIC FACILITY(585)																
STUDENT HOUSING (585)																
STUDENT SERVICES (585)																
ROTC PROGRAMS (585)																
FRESHMAN GPA (566)																
SOPH RETENTION (509)																
GRADUATION RATE (585)																
GRAD SCHOOL RATE (312)																
REPUTATION (585)																
EDUCATNL PROGRESS(503)																

*p<0.05 **p<0.01

(cont. on next page)

Table 2 (cont.)

	STAGE TWO ENDOGENOUS VARIABLES (CONT.)											OUTCOMES VARIABLES					
VARIABLES (no. of observations)	ENRICH PRGS	REMED PRGS	LIB BOOKS	LIB JOURN	CURRIC DIVERS	ACTIV-ITIES	ATHLET PRGS	ATHLET FACIL	STUD'T HOUSE	STUD'T SERVIC	ROTC PRGS	FRESH GPA	SOPH RETEN	GRAD RATE	% GRAD SCHOOL	REPU-TATION	PRO-GRESS
CONSUMER PRICE (585)	.52**	-.18**	.54**	.15**	.18**	.39**	.53**	.41**	.28**	.31**	-.09*	.46**	.52**	.48**	.29**	.55**	.64**
COLLEGE SIZE (585)	.13**	.11**	.18**	.16**	.22**	.18**	.22**	.17**	.11**	.25**	.16**	-.01	.25**	.03	-.05	.01	.12**
STUDENT ABILITY (573)	.42**	-.24**	.48**	.19**	.15**	.40**	.52**	.42**	.30**	.23**	-.06	.45**	.53**	.36**	.31**	.43**	.61**
TOTAL REVENUES (593)	.37**	-.09*	.57**	.32**	.22**	.42**	.56**	.43**	.30**	.27**	.12**	.25**	.51**	.34**	.27**	.45**	.51**
REVENUE/STUDENT (585)	.26**	-.27**	.50**	.16**	-.01	.26**	.42**	.36**	.18**	.02	-.05	.29**	.38**	.44**	.45**	.55**	.51**
E&G EXPENDITURES (593)	.36**	-.07	.54**	.29**	.22**	.42**	.54**	.41**	.29**	.28**	.12**	.23**	.51**	.33**	.25**	.43**	.49**
TOTAL EXPEND (593)	.37**	-.09*	.55**	.31**	.23**	.43**	.56**	.44**	.31**	.28**	.11**	.24**	.51**	.34**	.25**	.44**	.50**
EXPEND/STUDENT (585)	.25**	-.28**	.45**	.13**	-.02	.25**	.40**	.35**	.17**	.01	-.08	.27**	.37**	.43**	.45**	.54**	.49**
ENDOWMENT VALUE (593)	.22**	-.20**	.60**	.18**	.06	.29**	.41**	.32**	.19**	.10*	-.02	.29**	.40**	.31**	.34**	.47**	.45**
LAND VALUE (593)	.16**	-.06	.30**	.41**	.09*	.21**	.25**	.24**	.22**	.15**	.09*	.13**	.29**	.19**	.16**	.15**	.26**
BUILDINGS VALUE (593)	.43**	-.15**	.54**	.26**	.25**	.49**	.61**	.48**	.35**	.25**	.05	.31**	.51**	.39**	.27**	.49**	.54**
EQUIPMENT VALUE (593)	.27**	-.08	.45**	.21**	.20**	.37**	.49**	.37**	.32**	.23**	.11**	.20**	.37**	.31**	.21**	.32**	.39**
AT-RISK STUDENTS (459)	-.33**	.36**	-.37**	-.15**	-.10*	-.33**	-.51**	-.41**	-.27**	-.09	.03	-.45**	-.49**	-.43**	-.29**	-.38**	-.60**
PERCENT PHD'S (525)	.37**	-.14**	.29**	.14**	.01	.26**	.33**	.33**	.19**	.12**	.02	.24**	.33**	.28**	.30**	.33**	.38**
% F-T FACULTY (528)	.19**	-.14**	.25**	.14**	.16**	.42**	.43**	.37**	.32**	-.01	.15**	.11*	.15**	.24**	.06	.34**	.21**
FAC/STU RATIO (561)	-.01	-.00	.07	.00	-.02	-.11**	.04	.10*	-.12**	.04	-.09*	.08	-.02	.05	.24**	-.06	.01
ENRICH PROGRAMS (585)	1.00	.08*	.35**	.12**	.37**	.47**	.50**	.45**	.29**	.42**	-.01	.34**	.42**	.31**	.05	.36**	.44**
REMEDIAL PROGRAMS(585)		1.00	-.09*	.01	.14**	.03	-.02	-.03	.03	.28**	.06	-.18**	-.22**	-.12**	-.25**	-.13**	-.27**
LIBRARY BOOKS (585)			1.00	.32**	.12**	.31**	.46**	.40**	.17**	.23**	.05	.31**	.39**	.33**	.31**	.42**	.45**
LIBRARY JOURNALS (585)				1.00	.03	.08*	.19**	.17**	.07	.13**	.10*	.10*	.18**	.14**	.07	.13**	.17**
CURRIC DIVERSITY (585)					1.00	.40**	.30**	.22**	.27**	.31**	.02	.08*	.10*	.17**	-.09	.08	.11*
ACTIVITY PROGRAMS(585)						1.00	.59**	.48**	.50**	.29**	.09*	.18**	.29**	.30**	.09	.35**	.33**
ATHLETIC PROGRAMS(585)							1.00	.64**	.46**	.31**	.07	.28**	.42**	.44**	.15**	.47**	.46**
ATHLETIC FACILITY(585)								1.00	.29**	.30**	.03	.26**	.33**	.37**	.12*	.37**	.38**
STUDENT HOUSING (585)									1.00	.25**	.01	.08*	.15**	.25**	.04	.25**	.18**
STUDENT SERVICES (585)										1.00	.00	.20**	.20**	.22**	-.04	.13**	.20**
ROTC PROGRAMS (585)											1.00	-.15**	.00	-.04	-.05	.04	-.08
FRESHMAN GPA (566)												1.00	.51**	.29**	.23**	.22**	.81**
SOPH RETENTION (509)													1.00	.33**	.28**	.39**	.81**
GRADUATION RATE (585)														1.00	.15**	.38**	.69**
GRAD SCHOOL RATE (312)															1.00	.23**	.31**
REPUTATION (585)																1.00	.42**
EDUCATNL PROGRESS(503)																	1.00

*p<0.05 **p<0.01

The correlations range from .28 between **Consumer Price** and **Student Housing**, to .53 between **Consumer Price** and **Athletic Programs**.

It is quite evident from these correlations that there is a positive and significant relationship between price and resources. Twenty of the 22 correlations revealed moderate to strong positive correlations. Only **Faculty/Student Ratio** was not correlated with price, while **Remedial Programs** was negatively correlated.

Price and Reputational Quality. Of course, the quantity of resources is but one dimension of institutional quality. An institution's reputation is built upon many factors, including intangible qualities not readily amenable to quantitative measurement. To the degree that an institution's demand for admission is an indicator for these intangibles, then an institution's application rate is one measure of its quality. Accordingly, the relationship between **Consumer Price** and **Reputation** (which is based on application rates) was analyzed next. As can be seen, these two variables are strongly and positively correlated (at .55). This indicates that higher priced institutions have a better reputation than lower priced institutions. This may indicate that students and their parents perceive higher cost institutions as having better quality or as delivering a greater personal return (or value, however families may define it) for their college tuition dollar and time investment.

Price and Selectivity. The correlation matrix also shows the relationship between **Consumer Price** and **Student Ability**. Certainly, the quality of an institution's educational program is affected by the quality of its student body. It is common wisdom that brighter students make for a more challenging and stimulating classroom environment, not only for themselves, but for their classmates and instructors as well. Many institutions capitalize on this fact and strive to improve their quality by recruiting better students. Therefore,

another measure of institutional quality is general student ability level. (Of course, incoming student ability is really a measure of the quality of an institution's inputs rather than of its effectiveness; however, the argument can be made that student ability is also one of the essential institutional process factors leading to increased performance and better outcomes for all students.) That incoming student ability is an important factor was first recognized by Astin as outlined in the conceptual framework and literature review sections of this paper.

The correlations presented above lend support to Astin's observations. **Consumer Price** and **Student Ability** are correlated with each other at .66, the strongest relationship of the two dozen price/quality correlations covered so far. This indicates, again as Astin points out, that students are not randomly distributed among all institutions. Rather, better students tend to go to higher priced institutions, or, to turn it around, high cost schools attract the best students.

Price and the Quality of Student Outcomes. To play on Schapiro's earlier comment (see Chapter II), one might find fault with the correlations just presented because "assessing inputs is only half of a productivity analysis." That is, resources, reputation, and student ability are merely inputs into the educational process. One might argue that true institutional quality can only be measured after a consideration of inputs and outputs. Toward that end, the relationships between **Consumer Price** and five student outcome variables were analyzed. In all five cases, **Consumer Price** was strongly and positively correlated with those outcomes, ranging from .29 with **Grad School Rate** to .64 with **Educational Progress**. This indicates quite obviously that the higher priced institutions have better performance in regards to student educational outcomes than do lower priced

institutions. However, since it has been demonstrated that higher priced institutions also attract better students, it cannot be determined from these findings alone whether the better performance of higher cost institutions is due to what they are doing with their greater resources, or to the fact that they have better students to begin with who naturally do better and have better outcomes.

Question Two: Patterns and Characteristics

Although the correlations performed for the first research question estimated overall effects, it was hypothesized that there could be variations within these general patterns and trends. The second research question sought to explore price/quality relationships in more detail by asking, "Do all colleges follow a similar pattern with respect to consumer price and indicators of institutional quality, and if not, what institutional characteristics might account for or explain counter patterns?" In order to answer that question, two separate approaches were taken to explore performance patterns and institutional characteristics.

Price and Educational Progress. The first approach consisted of plotting **Consumer Price** against **Educational Progress**. The resultant plot is presented in Figure 2. A vertical line has been overlaid at the mean score (0.0) for **Educational Progress**, and horizontal overlays have been placed at the $4,000 and $8,000 levels for **Consumer Price** to aid interpretation. As can be seen by the obvious right-leaning slant of the plot, institutional performance on **Educational Progress** generally is better as **Consumer Price** goes up. A closer examination reveals that each of the 57 institutions charging $8,000 or more had **Educational Progress** scores above the mean for all institutions. On the other hand, few institutions (only 24 out of 127) charging $4,000 or less performed above the mean. Those institutions posting a **Consumer Price** between $4,000 and $8,000 are about evenly split with 167 having

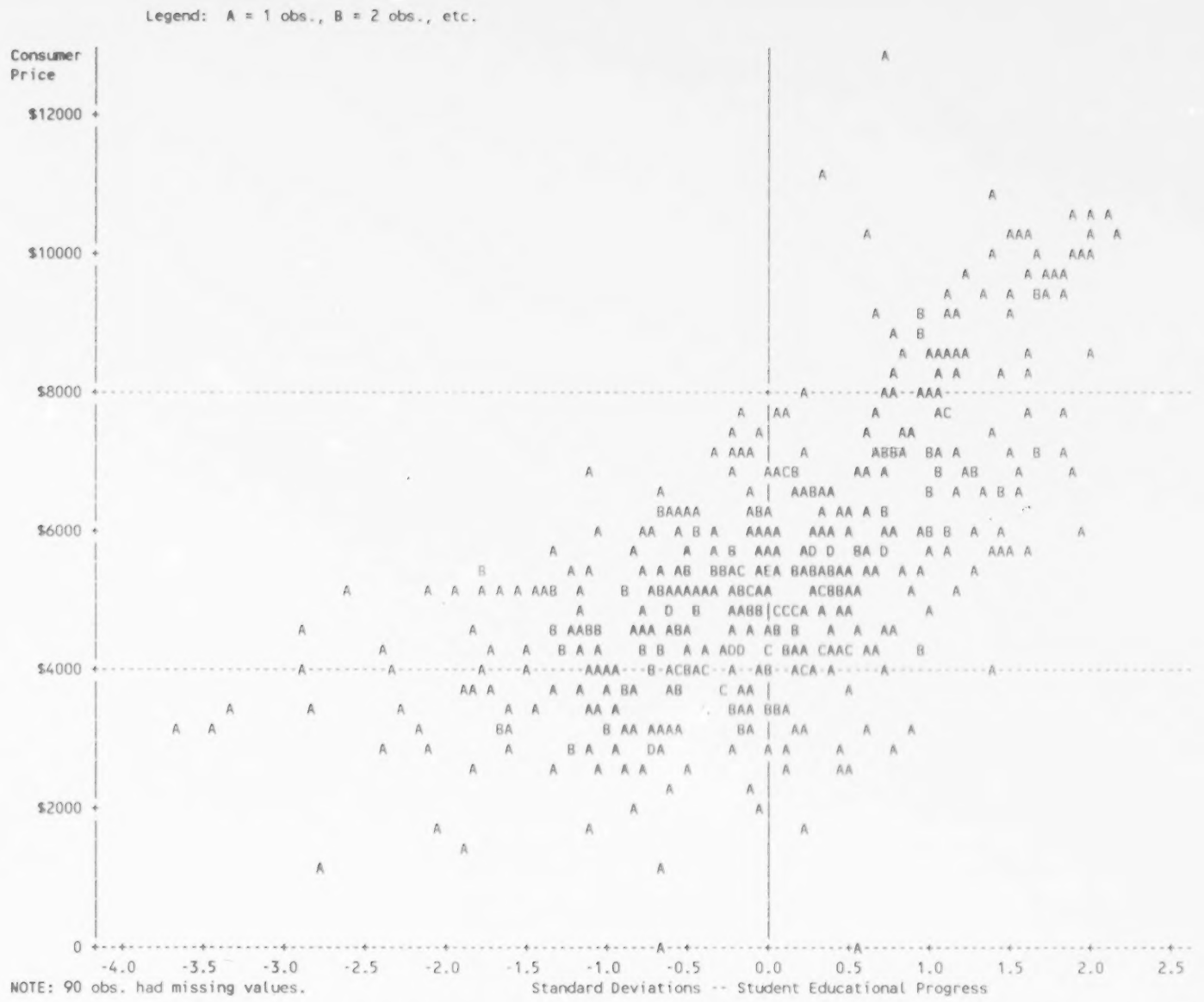

Figure 2. Plot of Consumer Price with Educational Progress

a score on **Educational Progress** above the mean and with 152 having a score at or below the mean. In addition, the only institutions with performance scores equal to or greater than 2 standard deviations above the mean for **Educational Progress** (a total of 6) are those charging more than $8,000. At the other end of the scale, no institution charging less than $4,000 performed better than 1 standard deviation above the mean for **Educational Progress**, and the three institutions performing less than 3 standard deviations below the mean are all from this low-cost group. (Note that 90 institutions had missing values and are not included in the above observations.)

Two primary conclusions can be drawn from the results presented above. First, in general it appears that the higher priced institutions do, in fact, perform better in regards to the educational progress of their students. In addition, the quality of these institutions is fairly uniform. On the other hand, the second conclusion is that within each price class there is a wide range of institutional performance. For example, within the group of institutions priced at $8,000 and above, scores on **Educational Progress** range from just above the mean for all institutions to more than 2 standard deviations above the mean. Furthermore, the three highest-priced institutions don't have the best performance (and, in fact, there are three colleges in the lowest-priced group that perform better than the two most expensive institutions). Even wider scores on **Educational Progress** are evident for the institutions with prices under $4,000 and those with prices in the $4,000-$8,000 range (ranging over 5 standard deviations--from 1 or 2 above the mean to 3 or 4 below the mean). This seems to support both of the rather contradictory assumptions discussed in Chapter I. That is, while it may be that "you get what you pay for" one could also conclude that "it pays to shop around."

Four Cost-Quality Groups. In order to explore the characteristics of institutions performing with, and counter to, the general price-quality trends in more detail, the sample of institutions was divided into four groups as follows: (1) low-cost, low student educational outcomes; (2) low-cost, high outcomes; (3) high-cost, low outcomes; and (4) high-cost, high outcomes (as indicated in Figure 3). Simple descriptive statistics were generated for the institutional and student characteristics variables for each group. The results are summarized in Table 3.

		CONSUMER PRICE (TUITION & FEES)	
		LOW	HIGH
EDUCATIONAL OUTCOMES	LOW	Group 1 N=157 Expected Pattern	Group 3 N=94 Counter Pattern
	HIGH	Group 2 N=64 Counter Pattern	Group 4 N=187 Expected Pattern

Figure 3. Division of Institutions by Price and Quality

An analysis of the number of institutions in each group indicates that 67 percent of the high-cost half have high outcomes while 71 percent of the low-cost half have low outcomes. These finding were to be expected if the "myth" that price reflects quality holds true. However, the summary presented below also indicates that 158 of the 502 institutions (31 percent) run counter to expectations, suggesting, again, that perhaps it also "pays to shop around."

Table 3. Variable Means for Four Price-Outcome Groups

VARIABLES	INSTITUTIONAL GROUPS			
	Low-Cost Half		High-Cost Half	
	Low---Outcomes---High		Low---Outcomes---High	
	1 (N=157)	2 (N=64)	3 (N=94)	4 (N=187)
Consumer Price	3699	4019*	5711**	7185**
Total Aid Dollars	1.7 M	2.0 M	2.7 M*	3.9 M**
Aid/Aided Student	2252	2416	3403**	4591**
Net Price	1663	1930	2711**	3974**
Student Ability	841	873^	917*	1033**
Institutional Size	1095	1061	1213	1315
Total Revenues	7.6 M	8.6 M	10.4 M^	17.7 M**
Revenue/Student	7671	8476	9044	13366**
E & G Expenditures	6.4 M	6.9 M	8.4 M*	13.7 M**
Total Expenditures	7.6 M	8.5 M	10.2 M^	16.9 M**
Expend/Student	7676	8446	8916	12865**
Land Value	556 K	822 K	874 K	1106 K^
Buildings Value	8.0 M	9.7 M^	11.3 M	19.9 M**
Equipment Value	2.2 M	2.5 M	3.0 M	4.6 M**
Endowment Value	4.9 M	7.5 M^	6.0 M	32.7 M**
Percent Minority	23	10**	10	7**
Percent Part-Time	27	20*	25	11**
Age Of Students	21.8	21.6	21.1	20.2**
Percent Commuters	49	39*	37	21**
Percent On Aid	78	75	76	68**
At-Risk Students	0.64	0.06**	0.10	-0.67**
Percent Fac. PhD	41	47*	48	63**
% Full-Time Fac.	66	64	68	77**
Fac/Student Ratio	8.45	8.34	7.58	8.45*
Enrichment Prgms.	6.6	7.6*	8.5^	10.6**
Remedial Programs	5	5	5	4**
Library Books	82 K	118 K**	100 K^	230 K**
Library Journals	569	1140	759	1407*
Curricular Divers.	31	36*	37	38
Activity Programs	10	11*	11	13**
Athletic Programs	10	11*	11	16**
Athletic Facility	3	4**	4	5**
Student Housing	4.4	4.7	5.2^	5.6
Student Services	10	11*	11	11
ROTC Programs	1	1	0	0
Freshman GPA	79	88**	81**	92**
Soph Retention	67	80**	71**	84**
Graduation Rate	14.3	18.4**	15.5**	21.5**
Grad School Rate	26	34^	27	38**
Application Rate	40.2	44.1	54.2^	85.4**
Educat. Progress	-0.88	0.36**	-0.56**	0.92**

^p<.10, *p<.05, **p<.01 for T-Test with group on left
K=thousand, M=million

The 157 institutions in the low-cost, low outcomes group (Group 1), as well as the 187 in the high-cost, high outcomes group (Group 4) represent the expected pattern. That is, those institutions costing less would be expected to have fewer resources and to be less effective in terms of student outcomes, while those costing more would be expected to have greater resources and be more effective. On the other hand, the 94 institutions with high price but low outcomes (Group 3) and the 64 low-price, high outcomes institutions (Group 2) run counter to this conventional wisdom.

Expected Patterns. Looking more closely at the four groups, it can be seen that as one goes from Group 1 to Group 4, **Consumer Price** increases quite dramatically from $3,699 for Group 1, to $4,019 for Group 2, $5,711 for Group 3, and $7,185 for Group 4. Moreover, the value for each resource and outcome variable is significantly higher for institutions in Group 4 compared to those in Group 1 with only three exceptions.[34] The Group 4 colleges not only have more resources, they also have students with much higher academic ability (with median SAT scores at 1033 as compared to 841 for the Group 1 institutions). In addition, the Group 4 institutions have fewer at-risk students. That the colleges with more resources, brighter students, and fewer at-risk students would demonstrate better performance on student educational progress is not surprising. But what about the two groups that seemingly run counter to this trend?

Counter Patterns. An analysis of the institutions in Group 2 (low-cost, high outcomes) and Group 3 (high-cost, low outcomes) reveals some interesting findings. First,

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[34]The exceptions being **Faculty/Student Ratio** (which is, surprisingly, the same), **Remedial Programs** (not surprising since the low-cost colleges have students with lower ability), and **ROTC Programs** (only a slight difference with the high-cost institutions reporting no ROTC programs and the low-cost ones reporting only one ROTC program).

although the colleges in Group 2 perform in the top half of all institutions, they don't do as well as the Group 4 institutions (**Educational Progress** at 0.36 compared to 0.92 standard deviations above the mean). While good results don't necessarily require a lot of money, getting the best results apparently does. On the other hand, the colleges in Group 3 don't do as badly as the Group 1 institutions (**Educational Progress** at -0.56 standard deviations below the mean as compared to -0.88). A high price tag doesn't always mean high quality, but again more money does seem to guard against the worst outcomes.

Comparing Group 2 (low cost/high outcome) directly with Group 3 (high cost/low outcome), there are both several similarities and differences. Group 3 institutions have significantly greater resources in terms of such financial variables as **Total Revenues**, **E & G Expenditures**, and **Total Expenditures**. This is largely explained by the fact that Group 3 institutions are both larger (1,213 versus 1,061 students) and charge significantly more for tuition and fees ($5,711 versus $4,019). On the other hand, **Revenue Per Student** and **Expenditures Per Student** are not significantly different for the two groups of institutions. This can be explained by the fact that average **Endowment Value** is considerably less at Group 3 institutions than at Group 2 institutions ($6 million as compared to $7.5 million). This means that Group 3 institutions have small endowments for their size (and possibly also comparatively small gift, grant, and other revenues), and that tuition must therefore be set relatively high in order to provide the same level of expenditures as Group 2 institutions.

These findings are reflected by the fact that students at Group 3 institutions must bear 64 percent of their educational costs (**Consumer Price** divided by **Expenditures Per Student**) compared to only 47.6 percent for students at Group 2 institutions, and by the fact that the aid gap (**Consumer Price** minus **Aid Per Aided Student**) for students on aid at Group

3 institutions is $2,308 versus $1,603 for students at institutions in Group 2. These findings suggest one possible basis for the apparent differences between the four institutional groups. That is, the higher tuitions and fees at the most expensive colleges, even with increased student financial aid, are still out of reach for less affluent students. Students who must live at home and commute or go to school part-time while working cannot afford the more expensive schools. Older students (perhaps financially independent) and students from minority backgrounds also have a more difficult time affording high tuitions and so tend to congregate in the less expensive colleges. These colleges, in turn, not only have less revenues to spend on quality improvements generally, but they must spend a larger amount of their limited resources providing more remedial services. If the student cost burden and aid gap contribute to student attrition, as they might, then these two factors would help explain why Group 3 institutions have such low student outcome scores, especially considering the fact that they have almost the same amount of at-risk students as Group 2 institutions, and the fact that the ability level of their students is higher than for institutions in either Group 1 or Group 2.

Factors other than the student cost burden and aid gap could be behind the low student outcome score for Group 3 institutions. To explore that possibility, the mean values for the academic resources and student services variables were also examined. The results indicate that there are no significant differences between the institutions in Group 2 and Group 3 for these variables, with only three exceptions. Group 3 institutions have a slightly greater number of enrichment programs and student housing types than Group 2 institutions. However, institutions in Group 3 have fewer library volumes than those in Group 2. Although not representing statistically significant differences, Group 3 institutions

have **Buildings Value** and **Equipment Value** that are $2.1 million higher than Group 2 institutions, but they also have 33 percent fewer **Library Journals**.

It appears that Group 3 institutions, as compared to institutions in Group 2, use their greater total revenues more for physical resources than for library resources. The fact that they have lower scores on the student outcomes variables as well, may indicate that such a resource allocation strategy is not the most effective in terms of educational quality. On the other hand, Group 3 institutions have an **Application Rate** that is 10 percentage points higher than Group 2 institutions. This may indicate that prospective students perceive Group 3 institutions as having higher quality than Group 2 institutions on the basis of price alone, or perhaps the more extensive physical plants at Group 3 institutions impress prospective students who visit those campuses. So, from a student recruitment perspective, a strategy of charging a high price coupled with a resource allocation pattern favoring physical appearances seems, by itself, to be effective in terms of generating a positive reputation.

Results: Part Two

Reducing the Number of Variables

In order to test the conceptual model of institutional effectiveness and answer the third and fourth research questions, the number of variables in the **Operationalized Conceptual Model** had to be reduced, both to eliminate nonsignificant variables and to make the path-analytic model more elegant and parsimonious. This was done in several steps.

The first step was to drop **Total Financial Aid**, **Aid Per Student**, and **Net Price** as exogenous variables in the model. This was done strictly for conceptual reasons. Only one

price variable was required for the study, and since published (gross) price is the focus of public debate about college costs and is the "purer" indicator for price-quality comparisons, **Consumer Price** was chosen and the other three were dropped.

The second step was to drop **Revenues Per Student** and **Expenditures Per Student** from further consideration. The effects of enrollment are controlled in the model by the **Institutional Size** variable, making the two dropped variables redundant. The remaining seven stage-one financial and physical plant variables were then analyzed using correlational and factoring techniques to see if they could be collapsed into a single scale or variable. A principal components analysis revealed that all seven could be captured by one factor explaining 75 percent of the total variance, with **Total Revenues** having a loading of .98 on that factor. A test of internal consistency using Pearson correlation coefficients for the seven variables yields an interitem reliability estimate (Cronbach's alpha) of .94, with **Total Revenues** being the variable most highly correlated with every other variable. Therefore, **Total Revenues** was used to represent all of the stage-one finance and physical plant variables in the model.

In the third step, **Percent Commuters** was dropped from the model for three reasons: (1) this variable was highly correlated (at .60, with $p < .0001$) with **Age of Students**, indicating that one or the other should be dropped to avoid multicollinearity; (2) it was also correlated with **Percent Part-Time** (which had a higher N of 585 as compared to 540); and (3) **Age of Students** and **Percent Part-Time** were conceptually "purer" than **Percent Commuters** (that is, they are temporally antecedent--older students attending part time are usually commuters, but commuters are not necessarily older and attending part time). Next, the remaining four stage-one student characteristics variables were then analyzed using

correlational and multivariate techniques to see if they could be collapsed into a single scale or variable. The results indicated that one scale could represent the effects of the four variables, therefore, each was standardized and their scores added together to create the **At-Risk Students** composite variable.

In the last step, the **Reputation** variable was dropped from the model because it is not related to this study's focus on student-related educational achievement, retention, and attainment outcomes. Then, **Grad School Rate** was dropped because of its relatively low N (312). The remaining three outcomes variables were then analyzed using correlational and factoring techniques to see if they could be collapsed into a single scale or variable. A principle components analysis revealed that all three could be captured by one factor explaining 59 percent of the total variance. In addition, a test of internal consistency for the three variables using Pearson correlation coefficients yields an interitem reliability estimate (Cronbach's alpha) of .65, indicating quite clearly that one scale could be developed. Therefore, the three variables were standardized and their scores added together to create the **Educational Progress** composite outcomes variable, which was used as the final dependent variable in all of the ensuing regressions for the study.

The General Empirical Model

The above considerations resulted in 20 variables: the 3 exogenous variables, 2 stage-one endogenous variables (including **At-Risk Students**), all of the 14 stage-two endogenous variables, and the 1 composite outcomes variable (**Educational Progress**). These 20 variables were used to construct the **General Empirical Model** (Figure 4), which is a further refinement of the conceptual framework that guided this study.

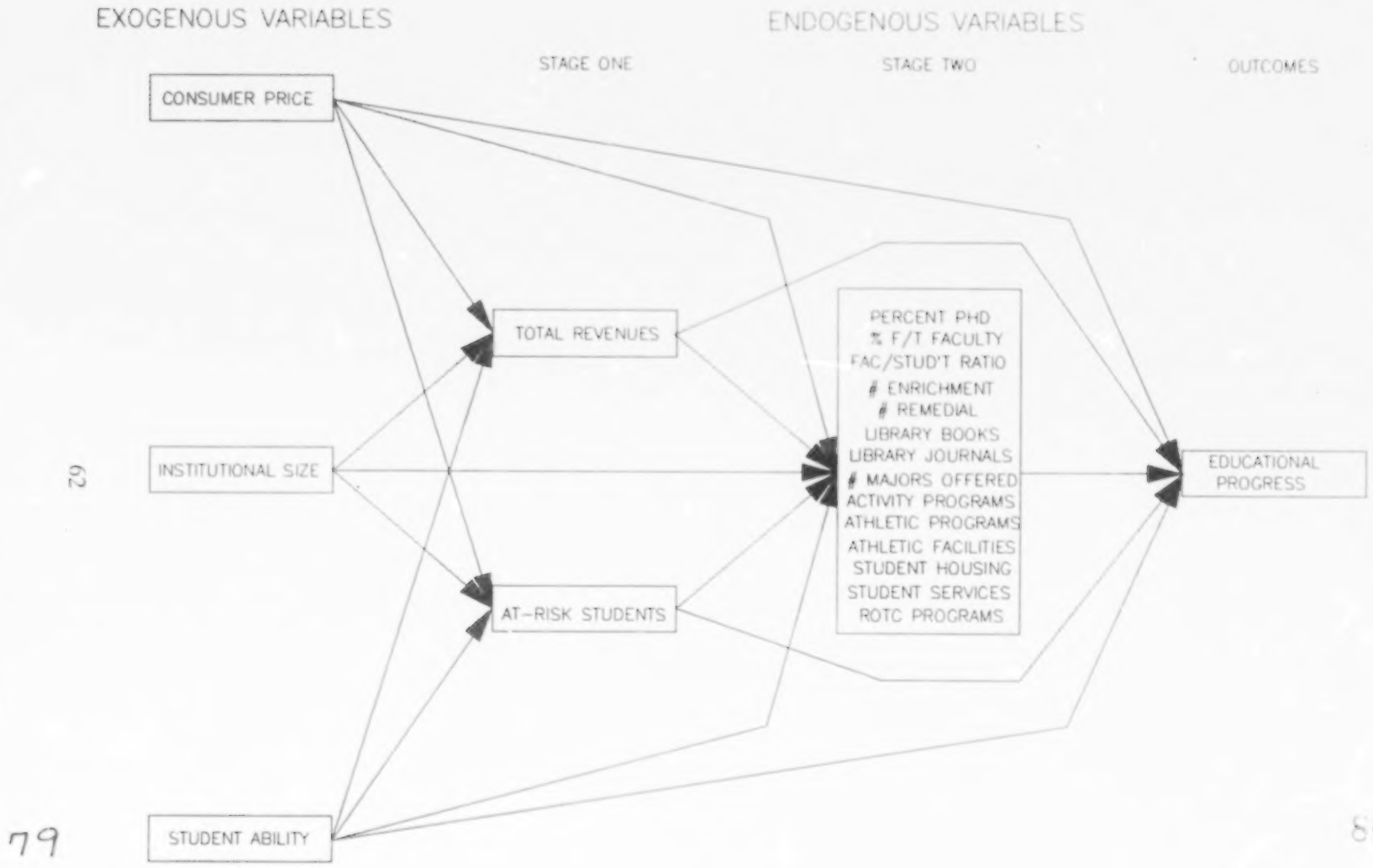

Figure 4. General Empirical Model

Question Three

The third research question asked, "To what degree do consumer price and student ability, in contrast to the institutional variables suggested by the conceptual framework as representing the structural components of the education production process, explain institutional effectiveness as defined by performance on student educational progress?" This question was answered by performing three multiple regression analyses using the **General Empirical Model** discussed above. **Educational Progress** was regressed, in turn, first on the 3 exogenous variables, next on those 3 plus the 2 stage-one endogenous variables, and last on those 5 plus the 14 stage-two variables in order to determine the additional contribution of the environmental variables to R-square.

Impact of Exogenous Variables. The first multiple regression analysis was performed in order to establish a "base line" against which to measure institutional impact. As can be seen by the regression results presented below in Table 4, **Student Ability** (at .33 with $p<0.001$) and **Consumer Price** (at .43 with $p<0.001$) are both highly significant and robust (**Institutional Size**, at -0.02, is not significant). Together, they account for 46 percent of student educational progress (R-square for the model is at .4655, and adjusted R-square is at .4623). Thus, these input variables alone explain a sizeable portion of institutional performance on **Educational Progress**.

Stage-One Endogenous Variables. The next regression added the two stage-one endogenous variables to the three exogenous variables in order to calculate the net additional explanatory power provided by **Total Revenues** and **At-Risk Students**. As can be seen, the addition of these two variables increases R-square from .47 to .55, an increase of

Table 4. Summary of Regressions Using the General Empirical Model Including Significance and Parameter Estimates for Educational Progress

VARIABLES	WITH JUST EXOGENOUS VARIABLES	PLUS STAGE ONE ENDOGENOUS	PLUS STAGE TWO ENDOGENOUS
Consumer Price	0.43***	0.21***	0.12*
Student Ability	0.33***	0.25***	0.20***
Institutional Size	-0.02	-0.13*	-0.22**
Total Revenues		0.19**	0.22**
At-Risk Students		-0.29***	-0.31***
Percent Faculty PhD			0.08*
Percent F-T Faculty			-0.11*
Faculty/Student Ratio			0.02
Enrichment Programs			0.10*
Remedial Programs			-0.07ˆ
Library Books			-0.01
Library Journals			0.01
Curricular Diversity			0.02
Activity Programs			0.09ˆ
Athletic Programs			0.05
Athletic Facilities			-0.04
Student Housing			-0.09*
Student Services			0.07ˆ
ROTC Programs			-0.05
Model R-square	.4655	.5502	.6076
Adjusted R-square	.4623	.5447	.5875

***p<0.001, **p<0.01, *p<0.05, ˆp<0.10

8 percentage points. Furthermore, all the variables are significant (at $p<.05$) and strong, with parameter estimates all greater than |.10|, even including **Institutional Size**. The parameter estimate for **Student Ability** has declined from .33 to .25 while, at the same time, the estimate for **At-Risk Students** comes in at -0.29 (the strongest of all five variables). These results seem to indicate that the percentage of at-risk students at an institution has an effect on student outcomes over and above the effect of student ability levels. That is, even after controlling for incoming student ability, students in at-risk categories have poorer educational progress than others.

Similarly, the parameter estimate for **Consumer Price** drops from .43 to .21, while **Total Revenues** comes in at .19 when the first five variables are considered together. It would seem that much of the effect of **Consumer Price** on **Educational Progress** is due to its contribution to **Total Revenues**. These findings indicate, however, that **Total Revenues** has an impact on **Educational Progress** over and above **Institutional Size** and **Consumer Price**. This is not surprising since **Total Revenues** includes revenues other than tuition and fees, and those other revenues are also assumed to contribute to institutional quality. Of more interest is the fact that **Consumer Price** remains significant after controlling for the other factors. This indicates that price alone, regardless of its contribution to total revenues, is a factor in student outcomes. This suggests that Festinger's cognitive dissonance theory may be operating in student persistence decisions--that is, student goal achievement (for example, graduation) is at least partially explained by the amount of investment (money, in this case) put into it.

Stage-Two Endogenous Variables. The last regression for Research Question Three added the 14 stage-two endogenous variables representing the institutional environment to

the first 5 variables. Once again, the model is both significant and robust. With R-square at .61 and Adjusted R-square at .59 (very high for social science research), 60% of **Educational Progress** is explained by the 19 variables in the model. The six percentage points increase in R-square (from .55 to .61) indicates that the 14 environmental variables have a small but significant impact on **Educational Progress**. This finding is consistent with several earlier studies by Thistlethwaite (1959a, 1959b), Astin (1961, 1962), Nichols (1965), Wegner and Sewell (1970), and others reviewed earlier. Altogether, the endogenous variables (all 16 identified in the **General Empirical Model**) represent an institutional impact of 14 percentage points (calculated as the increase in R-square from .47, in the first regression with just the three exogenous variables, to .61 in the last regression).

Analysis of the General Empirical Model. In examining the results of the last regression using the full **General Empirical Model** more closely, it can be seen that all three exogenous variables and both of the first-rank endogenous variables are significant ($p<.05$) and strong, with parameter estimates $> |.10|$. The parameter estimate for **Student Ability** is reduced from .25 (in the second regression) to a smaller .20 (in the last regression). The estimate for **Consumer Price** is also smaller, declining from .21 to .12; however, its continued significance and strength indicate that cognitive dissonance may still be a factor. In contrast to these declining values, the contribution of **Institutional Size** becomes stronger, going from -0.13 in the second regression to -0.22 in the last regression. Likewise, **At-Risk Students** goes from -0.29 to -0.31 and remains the strongest variable in the model.

The parameter estimate for **Total Revenues** increases from .19 to .22, which is somewhat surprising. One might expect that the effect of **Total Revenues** on **Educational Progress** would come from its contribution to the educational technologies and services that

such revenues would buy, and that it would not have a strong direct effect. It was expected that the estimate for **Total Revenues** would decrease substantially once the 14 environmental variables were introduced into the model (similar to the decrease in **Consumer Price** after **Total Revenues** was introduced in the second regression). Apparently, however, there are aspects of institutional quality not represented by the 14 environmental variables in the model, which perhaps are captured by **Total Revenues**.

Turning to the 14 structural-environmental variables, 4 are clearly significant (**Percent Faculty PhD**, **Percent Full-Time Faculty**, **Enrichment Programs**, and **Student Housing**, all of which with $p < .05$), and 3 others are marginally significant (**Remedial Programs**, **Activity Programs**, and **Student Services**, all with $p < .10$). The other seven variables are not significant at all. These findings have elements both in common with and different from those found in the correlation analyses and the studies examined earlier in the literature review.

Contradictions in the Findings. The first contradiction comes from a comparison of these regression results with the correlations done for Research Question One. It can be seen that **Library Journals**, **Curricular Diversity**, and **Athletic Facilities** are not significant predictors of **Educational Progress** after the exogenous and first-rank endogenous variables are introduced, even though all these factors were found to be correlated with **Educational Progress**.

It is also surprising that **Faculty/Student Ratio** is not a significant factor in student progression to a baccalaureate degree, especially given the emphasis placed on student-faculty interaction by Tinto's student integration theory and Astin's (1977) findings that student-faculty interaction was a significant factor for increased student involvement.

Perhaps in-class interactions are not the most important element, but rather, it may be the unmeasurable out-of-class interactions that are the key -- interactions whose frequency may not be determined by class ratios but by faculty dedication, commitment, teaching loads, and availability. This suggests that some cost savings could be realized (without sacrificing quality) by increasing class size slightly. Of course other, less desirable, consequences could also result from such action. Consideration must be given to findings by Astin (1962) that faculty/student ratios were a significant factor in Ph.D. production, and studies by Hartnett (1976) and McGuckin and Winkler (1979) that found test scores to be closely related to class size (as reviewed earlier).

Another interesting discovery in these results is the finding that **Remedial Programs** continues to be a factor even after controlling for **Student Ability** and **At-Risk Students**, and the fact that **Remedial Programs** is negative. There are at least three explanations for this finding. The first possible explanation is that, in providing more remedial programs, institutions are diverting resources away from more effective strategies (such as increasing faculty quality). Under this interpretation, institutions with large numbers of remedial programs would be allocating their resources in noneffective ways. However, this is not likely. It is more probable that institutions with remedial programs are responding to the needs of their students. This leads to the second scenario.

In order to understand a second and more likely explanation, it is necessary to remember that this study utilizes institutional- rather than student-level data. If these were student-level data, then the variable **Remedial Programs** would represent an intervention strategy mediating the effects of low student ability and at-risk factors. In such a case, a negative parameter estimate would indicate a failing of such programs. This would be a

surprise indeed. However, these are institutional-level data, and the above findings indicate that **Remedial Programs** stands for more than just the number of remedial programs. It would seem that **Remedial Programs** represents an institutional response to the total problem of underprepared students. That is, **Student Ability** and **At-Risk Students** don't capture the entire character of the students at an institution. There would seem to be an additional third group of students who have difficulty making educational progress, which is represented by **Remedial Programs**. Therefore, one can hypothesize that institutions having a large number of remedial programs also have a larger number of these "new" at-risk students. With that in mind, the negative coefficient for **Remedial Programs** makes sense; it should be treated the same way as the negative coefficient for **At-Risk Students**.

A third explanation, which combines some of the interpretations of the first two, is also feasible. **Remedial Programs** may be a marker for large, poorly funded, nonselective institutions serving a diverse student body, and providing a large number of academic, enrichment, and remedial programs. Such institutions, though private baccalaureate colleges, have characteristics more in common with public comprehensive colleges, and some of the same ills. Past research has indicated that smaller colleges with a clear and rigorously pursued mission have a much greater and positive impact on their students than larger institutions attempting to be "all things to all people" as appears to be the case here.

Turning now to the remaining variables, the finding that **Library Books**, **Athletic Programs**, and **ROTC Programs** are not significant predictors of **Educational Progress** is a departure from earlier research findings. The lack of significance for **Library Books** is particularly interesting, especially given the fact that library size is almost always included in listings of institutional quality characteristics. It seems likely that the inclusion of **Total**

Revenues in the regression equation may account for these findings since **Total Revenues** is more highly correlated with each of these variables than is almost any other variable. The correlations for **Total Revenues** are .57 with **Library Books**, .56 with **Athletic Programs**, and .12 with **ROTC Programs**. Apparently, after taking **Total Revenues** into consideration, these variables don't contribute any additional effect to **Educational Progress**.

Seeking a reason for why **Percent Full-Time Faculty** came up as a negative factor was also of interest since common belief and theory both suggest that a greater percentage of full-time faculty should make a positive contribution to student development and progress. In order to search for possible explanations of why **Percent Full-Time Faculty** would have a negative coefficient, an additional analysis was conducted. First, univariate statistics were generated for **Percent Full-Time Faculty** using the SAS Institute's software system for data analysis (SAS). From those statistics, the median (71.69811 percent) was identified and used to divide the institutional sample in half. All institutions with **Percent Full-Time Faculty** greater than or equal to the median were assigned to one group, and all those less than the median were assigned to a second group. Simple statistics were then generated for all the variables examined above for each of the two groups, and they are discussed below.

Colleges in the first group (those having the greater percentage of full-time faculty) generally have students with SAT scores that are nearly 70 points higher than colleges in the second group (957 versus 888). Furthermore, colleges in the first group have only half the percentage of commuter (26 percent versus 47 percent) and part-time students (11 percent versus 30 percent) as colleges in the second group. Altogether, the group one colleges have a mean score on **At-Risk Students** that is more than half of a standard deviation lower than the group two colleges (-0.30 versus .30). In addition to having more

full-time faculty, group one schools also have a greater percentage of faculty with the Ph.D. (55 percent versus 45 percent). Colleges in the first group pay for this high faculty quality with **Total Revenues** that are 50 percent higher than colleges in the second group even though average **Institutional Size** for the two groups is the same and **Consumer Price** is only $1,000 more at group one institutions (thus accounting for the fact that **Expenditures Per Student** at group one colleges are on average $11,344 versus $8,475 at group two colleges). Last, colleges in the first group have **Educational Progress** scores that are al- ost half a standard deviation higher than colleges in the second group (.24 versus -0.22).

These findings show, although a higher percentage of full-time faculty at an institution is correlated with better student retention and educational progress, that after controlling for financial resources and student characteristics the net additional contribution of full-time faculty to student educational progress not only disappears, but becomes significantly negative! The data do not indicate why this may be, so one more analysis was conducted.

The institutions were divided into groups based on high and low halves of student SAT scores, and then the regression model was rerun for each group. These new results revealed that **Percent Full-Time Faculty** was a significant (negative) factor at institutions with lower ability students (at -0.16*), but was <u>not</u> a significant factor at institutions with higher ability students. Moreover, with the exception of **At-Risk Students** (which was a significant factor in both groups), a different set of variables explained **Educational Progress** for the high- and low-ability groups.

What does all this mean in terms of the finding of a negative parameter estimate for **Percent Full-Time Faculty** in the **General Empirical Model**? Perhaps institutions with a

large percentage of full-time faculty are imbued with the "faculty research culture" more typical of Ph.D.-granting institutions. And while this may be just the right atmosphere for financially secure colleges filled with bright full-time and on-campus students whose plans most surely include graduate study, it may not work so well at institutions with a less traditional student body and fewer resources. Again, the message comes through that one approach to providing a higher education may not be appropriate to all students, and that clarity of mission along with a concomitant allocation of resources and programs may be the best way to meet the educational needs of a diverse Nation.

Structural Decisions on Inputs Dominate. In bringing this section to close, it is necessary to summarize a few of the more important findings.[35] In short, both of the "myths" introduced in Chapter I seem to be supported.

The fact that **Consumer Price** is significant and positive even with all the other variables in the model, suggests that price alone is a factor in institutional quality as measured by performance on student educational progress (whether or not this is due to its motivating ability à la Festinger, or due to some other effect).

In addition, the fact that seven second-rank endogenous variables are significant factors for **Educational Progress**, even after controlling for the effects of the exogenous and first-rank variables, seems to indicate that there is some institutional effect due to the existence of specific programs and faculty qualities. However, the largest structural effects appear to come from institutional decisions regarding initial inputs, that is, decisions setting

[35]But first, readers of these study results need to be reminded that the relationships investigated and the results reported do not purport to reveal "truths" about cause and effect. Rather, while these findings show factors associated with student educational progress and institutional effectiveness or quality, they most often will require further study in order to explain why certain relationships appear to exist.

tuition levels and admissions standards, and policies regarding full-time attendance and institutional size. The results have also suggested that certain specific structural characteristics may be more effective than others in promoting student educational progress, especially academic-enhancing enrichment programs and faculty quality. However, the results also caution administrators that not all academic characteristics are beneficial at all colleges, for example, those that promote an emphasis on research especially at institutions with underprepared and nontraditional students. Last, the results tend to confirm the impression that the richest colleges have the best students and faculty, the most resources, and the most diverse student-oriented facilities, programs, and services. The flip side to this finding is, of course, the fact that the colleges with the lowest tuition rates attract the least qualified students whose attendance patterns put them at even greater risk of dropping out, while at the same time, these same colleges (with the most needy students) have the fewest resources with which to address such problems. In short, the institutional impact may be positive for the best students, and negative for those students who are least prepared.

Question Four

The final question attempted to measure the degree to which the conceptual model measured institutional effectiveness and the independent contribution of each significant factor using a path analytic approach. Research Question Four asked: "What are the significant direct, indirect, and total effects of consumer price, student ability, and institutional characteristics on educational progress?" The analyses conducted to answer this question proceeded in three stages. A brief review of each step, along with the results generated, are presented as the last sections of this chapter.

Step One. The first stage involved reducing the number of variables in the **General Empirical Model** by eliminating any of the 19 variables that were not significant predictors of **Educational Progress** ($p > .10$) using the regression results from Research Question Three (above). Seven of the 19 variables were thus eliminated from further consideration as indicated in Table 5.

Table 5. Nonsignificant Variables

Variable	Parameter Estimate	Standard Error	T for HO: Parameter=0	Prob >|T|
Fac/Student Ratio	0.017039	0.05630391	0.303	.7623
Library Books	-0.008043	0.03736216	-0.215	.8297
Library Journals	0.009469	0.03123495	0.303	.7619
Curric. Diversity	0.017330	0.03539937	0.490	.6247
Athletic Programs	0.053418	0.05169928	1.033	.3022
Athletic Facility	-0.037583	0.04761974	-0.789	.4305
ROTC Programs	-0.054085	0.03510606	-1.541	.1243

As can be seen from the tests of significance presented in the last column (Prob > |T|), each variable has a probability of randomness greater than 10 percent, ranging from .1243 for **ROTC Programs** to .8297 for **Library Books**. Furthermore, none of these variables had parameter estimates greater than |.10| (the strongest was **ROTC Programs** at -0.054).

In order to see how much explanatory power would be lost by dropping these seven variables, **Educational Progress** was regressed on the remaining 12 variables constituting the "reduced" form of the model (hereinafter referred to as the **Reduced Empirical Model**). As can be seen from the summary presented in Table 6, there are only slight differences between the **General Empirical Model** and the **Reduced Empirical Model** in regards to parameter estimates and significance of the variables. One small difference is that, by

Table 6. Summary and Comparison:
Model Parameter Estimates and Significance

VARIABLE	General Empirical Model (N=392)	Reduced Empirical Model (N=396)
Consumer Price	.12*	.14**
Student Ability	.20***	.21***
Institutional Size	-0.22**	-0.24***
Total Revenues	.22**	.23***
At-Risk Students	-0.31***	-0.30***
Percent Faculty PhD	.08*	.07˙
Percent Full-Time Faculty	-0.11*	-0.13**
Faculty/Student Ratio	.02	
Enrichment Programs	.10*	.11**
Remedial Programs	-0.07˙	-0.07˙
Library Books	-0.01	
Library Journals	.01	
Curricular Diversity	.02	
Activity Programs	.09˙	.11*
Athletic Programs	.05	
Athletic Facilities	-0.04	
Student Housing	-0.09*	-0.08*
Student Services	.07˙	.07˙
ROTC Programs	-0.05	
R-square	.6076	.6026
Adjusted R-square	.5875	.5902

***p < 0.001, **p < 0.01, *p < 0.05, ˙p < 0.10

virtue of eliminating the seven variables, the **Reduced Empirical Model** uses four more institutions in the calculations (representing colleges that had missing data for at least one of the seven dropped variables). The primary finding is that there is only a very small reduction in explanatory power as a result of dropping the seven variables. Indeed, R-square is reduced by only .005 and Adjusted R-square actually improves slightly (due to the fact that there are fewer variables in the equation).

To compare the representativeness of institutions used in the computations for the **Reduced Empirical Model** (N=396) with the entire universe of 593 general baccalaureate institutions used in this study, a T-test was conducted for each of the 12 variables. The results indicated no significant differences for most variables. However, the sample institutions do have higher tuition rates and are more selective than the general population of baccalaureate institutions. Otherwise, there are no appreciable differences between the two models. With such results, the remaining analyses for Research Question Four could proceed with confidence using the reduced form (**Reduced Empirical Model**), a diagram of which is presented in Figure 5.

Step Two. This stage began the actual path analysis of the conceptual model. The analyses were all conducted using the reduced set of 13 variables derived in Step One as represented by the **Reduced Empirical Model**, and only those 396 institutions having full data for all 13 variables were used in the calculations.

The use of the path analytic approach required a hypothesized temporal sequence, weak causal ordering, and causal closure for an ultimate dependent variable in order to construct and analyze a path diagram to test the conceptual model. In this study, the **Educational Progress** variable (representing student academic achievement and retention) was

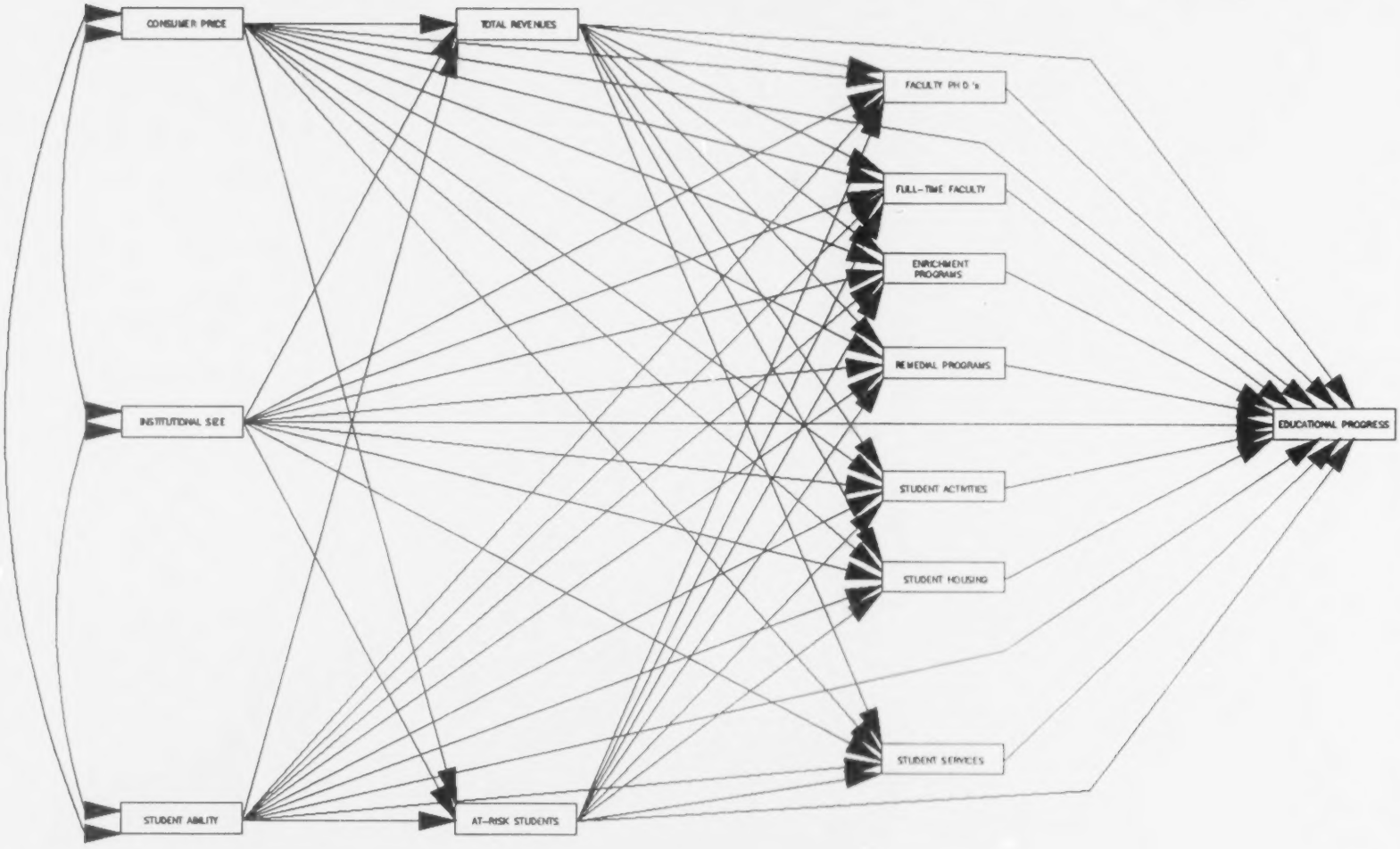

Figure 5. Reduced Empirical Model

hypothesized as being directly dependent upon several variables representing the institutional environment. These environmental variables were, in turn, hypothesized as being dependent upon three exogenous (outside the model) variables (**Consumer Price**, **Institutional Size**, and **Student Ability**). Furthermore, the three exogenous variables were hypothesized as having both direct and indirect effects on **Educational Progress** (indirect effects being those expressed through the intervening environmental variables). Any remaining variance in the environmental variables or **Educational Progress** was characterized as error variance; that is, variance caused by antecedents not measured in the model.

Consequently, the analysis required the solution of a series of structural equations. Following the conventions of path analysis, all the variables were first standardized (Mean=0, STD=1), and then a correlation analysis was conducted with the three exogenous variables (**Consumer Price**, **Institutional Size**, and **Student Ability**). Next, the two stage-one endogenous variables (**Total Revenues** and **At-Risk Students**) were separately regressed on the three exogenous variables. Then, in turn, each of the seven stage-two endogenous variables were regressed on all five of these precursor variables. Last, the dependent variable (**Educational Progress**) was regressed on all 12 independent variables in the model. The resulting standardized parameter estimates (beta weights) were used as the path coefficients in the path diagram. These coefficients may be interpreted as the direct causal effects of each antecedent variable on an endogenous variable. Each effect thus calculated is independent of other variables that may be operating on the same endogenous variables. The size and sign of the standardized beta weights indicate the amount of change in the dependent variable for every unit standard deviation increase in the predictor variable while holding constant the influence of all other predictors.

The results from the correlation analysis and the regressions employed in the structural analysis of the **Reduced Empirical Model** are summarized in Table 7 and Table 8.

Table 7. Correlations Between Exogenous Variables

	1 Consumer Price	2 Institut. Size	3 Student Ability
1. Consumer Price	1.00000	0.14378**	0.68823**
2. Institutional Size		1.00000	0.20209**
3. Student Ability			1.00000

**p < .01

The structural equations yielded standardized regression weights, which can be interpreted as the direct effects of each individual precursor variable (all three exogenous variables and all other causally antecedent endogenous variables) on each dependent variable including the final endogenous/dependent variable **Educational Progress** (see columns 4-13 in Table 8), holding constant the influence of all other predictors in the equation. The last column in Table 8, therefore, contains the values of the direct paths leading from each antecedent to the final dependent variable. Inspection of the results from the structural equations (Table 8) indicates that the variables in the model explain over 60 percent of the variance in student educational progress (R-square in column 13).

The correlation coefficients and the standardized regression coefficients (parameter estimates) from Table 7 and Table 8 were used to construct a path diagram of institutional effectiveness. According to the conventions of path analysis, the standardized regression weights were used as the path coefficients in the causal model. The model is presented in Figure 6 (page 82). Using this m del, not only can the direct effects of each predictor on

Table 8. Summary of Structural Equations for the Reduced Empirical Model

Beta Weights (Standardized Parameter Estimates) for Just-Identified Recursive System Representing the Reduced Empirical Model

VARIABLES	DEPENDENT VARIABLES									
	4	5	6	7	8	9	10	11	12	13
1. Consumer Price	.41**	-.31**	.18*	-.08	.34**	.03	.03	.01	.27**	.14**
2. Institut Size	.70**	.08	-.11	-.40**	.25**	.25**	.15ˆ	.05	.43**	-.24**
3. Stud't Ability	.27**	-.34**	.09	.06	.15*	-.32**	.13ˆ	.16*	.00	.21**
4. Total Revenues			.25**	.39**	-.05	-.04	.20**	.11	-.15ˆ	.23**
5. At-Risk Stud't			-.03	-.21**	-.03	.26**	-.14*	-.09	.10ˆ	-.30**
6. % Faculty PhD										.07ˆ
7. % F-T Faculty										-.13**
8. Enrich Prgrm										.11**
9. Remedial Prgrm										-.07ˆ
10. Activity Prgrm										.11*
11. Stud't Housing										-.08*
12. Stud't Service										.07ˆ
13. Educt Progress										
R-square	.7175	.3658	.2013	.2341	.2631	.2208	.2293	.1026	.1388	.6026
Adjusted R-square	.7154	.3609	.1911	.2243	.2537	.2108	.2194	.0911	.1278	.5902
Error Variance	.2825	.6342	.7987	.7659	.7369	.7792	.7707	.8974	.8612	.3974

ˆp < 0.10, *p < 0.05, **p < 0.01
N = 396

each endogenous variable readily be seen, but in addition, the indirect and total effects of each antecedent on **Educational Progress** can be calculated.[36]

The usefulness of path analysis is demonstrated by the following examination of a few of the paths represented in the diagram in Figure 6. Comparing the direct paths from **Consumer Price** to the second-order endogenous variables, versus those from **Total Revenues** to the same variables, it would seem that the money students pay in tuition is primarily supporting **Enrichment Programs** (with path coefficients of .34** versus -0.05), **Remedial Programs** (.03 versus -0.04), and **Student Services** (.27** as compared to -0.15^), while **Percent Faculty Ph.D** (.18* versus .25**), **Percent Full-Time Faculty** (-0.08 versus .39**), **Activity Programs** (.03 versus .20**), and **Student Housing** (.01 versus .11) are supported primarily from nontuition revenues. A comparison of the direct paths from **Consumer Price** to the two second-order variables effected most by **Consumer Price** (**Enrichment Programs** at .34** and **Student Services** at .27**), versus the direct paths from **Institutional Size** to these same two variables (.25** and .43**), seems to indicate that the tuition money going to **Student Services** does not keep up with increased enrollment (.27** versus .43**), while **Enrichment Programs** get more from tuition dollars than enrollment alone would seem to dictate (.34** versus .25**). This may indicate either that institutions place a greater value on providing enrichment programs than they do on providing student services, or it may indicate that there are some economies of scale operating in the provision of student services that cannot be realized in the operation of enrichment programs.

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[36]Indirect effects are the sum of the products of direct effects through intervening variables in the causal model. An indirect effect represents the influence of a predictor variable on **Educational Progress** mediated through such intervening variables. The total effect is simply the sum of the standardized direct and indirect effects.

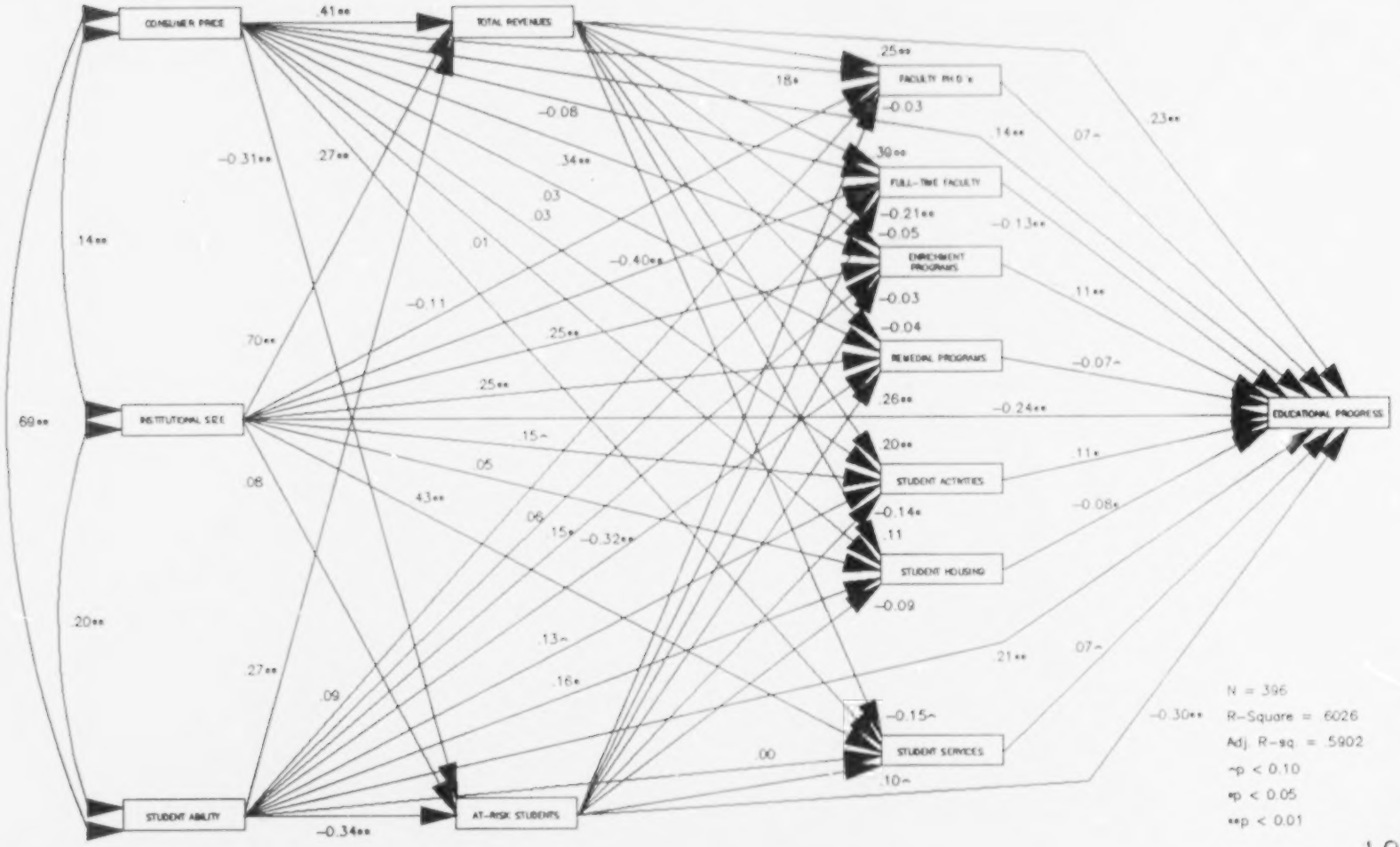

Figure 6. Path Diagram of the Reduced Empirical Model

Although the path diagram and the structural equations presented above would allow for the calculation of indirect and total effects, they were not calculated at this stage as there were too many variables and insignificant paths still remaining in the model to make analysis meaningful. The model needed to be "trimmed" before substantive meaning could be ascribed to the results. Therefore, a more parsimonious empirical model was constructed for the final analysis.

Step Three. The purpose of this last step was to trim the empirical model down to just those variables and paths representing the primary causal agents and linkages for student educational progress. In order to accomplish this end, the analyses proceeded in three stages.[37]

First, only those paths (beta weights) from the above structural equations table (for the **Reduced Empirical Model**) that were either significant at $p < 0.05$ or had path coefficients that were greater than or equal to 0.10 were retained. Then the structural equations were rerun using only those antecedent variables having retained paths to each endogenous variable. This produced **Trim Model 1**. The results of those regressions are summarized in Table 9.

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[37]The arbitrary criteria used for retaining or eliminating paths in the trimmed models were based on a protocol used by Schoenherr and Greeley (1974) wherein only paths with a beta greater than or equal to .10 were retained. The path models discussed thus represent over-identified linear recursive systems in which the regression equations have been recomputed after eliminating those terms not meeting the criteria for retention. However, there are two differences between the criteria used in the current study and those used by Schoenherr and Greeley. First, whereas the number of cases in their study was large enough that questions of statistical significance were unimportant, such is not the situation in the current study. Therefore, criteria of statistical significance were also used in the protocol for retaining/eliminating paths. Second (and unlike the approach used in the Schoenherr and Greeley study), the path trimming proceeded in several stages, with each stage using progressively stricter criteria for path retention. This procedure was followed in order to produce the most parsimonious final model possible while guarding against the chance of eliminating a significant path prematurely.

Table 9. Summary of Structural Equations for Trim Model 1

Beta Weights (Standardized Parameter Estimates) for First Over-Identified Recursive System

VARIABLES	DEPENDENT VARIABLES									
	4	5	6	7	8	9	10	11	12	13
1. Consumer Price	.41**	-.31**	.22**		.33**				.27**	.16**
2. Institut Size	.70**		-.12	-.38**	.21**	.23**	.13ˆ		.43**	-.24**
3. Stud't Ability	.27**	-.33**			.14*	-.32**	.14*	.20**		.23**
4. Total Revenues			.28**	.36**			.22**	.16**	-.15*	.24**
5. At-Risk Stud't				-.20**		.26**	-.15*		.10ˆ	-.32**
6. % Faculty PhD										-.14**
7. % F-T Faculty										.12**
8. Enrich Prgrm										
9. Remedial Prgrm										.11*
10. Activity Prgrm										-.08*
11. Stud't Housing										
12. Stud't Service										
13. Educt Progress										
R-square	.7175	.3619	.1977	.2305	.2619	.2202	.2289	.0972	.1388	.5926
Adjusted R-square	.7154	.3586	.1915	.2247	.2562	.2142	.2210	.0926	.1300	.5831
Error Variance	.2825	.6381	.8023	.7695	.7381	.7798	.7711	.9028	.8612	.4074

ˆp < 0.10, *p < 0.05, **p < 0.01
N = 396

As can be seen, application of the "trimming-down" criteria resulted in an empirical model with 17 fewer paths. However, the values for R-square were reduced by only 0.01 or less, and the values for Adjusted R-square actually increased in 7 of the 10 structural equations. In short, the results from the much more parsimonious **Trim Model 1** are very much the same as those produced by the **Reduced Empirical Model**.

The second stage was similar to the first. The structural equations table for **Trim Model 1** was examined. Then, only those paths that were significant at $p < 0.05$, or those that had path coefficients greater than or equal to 0.10 and which were at least significant at $p < 0.10$ were retained. Then, the structural equations were rerun for each dependent variable that had one or more of its predictor variables removed because of the above criteria (note that for most endogenous variables all antecedent variables had significant and robust paths, and so the structural equations from the previous stage were allowed to stand). These procedures produced **Trim Model 2**, and the results are summarized in Table 10. As can be seen, only one more path was eliminated by the new "trimming-down" criteria (from **Institutional Size** to #6 **Percent Faculty Ph.D.** at -0.12). Again, the results showed little change from the previous model. Of course, the overall model R-square was unchanged as all direct paths to **Educational Progress** (in column #13) were retained.

For the last stage, the **Trim Model 2** equations were examined to see whether all remaining paths met a final significance test of $p < 0.05$ (regardless of the size of the beta coefficients). Since two paths did not meet these criteria (**Institutional Size** to #10 **Activity Programs** at .13^, and **At-Risk Students** to #12 **Student Services** at .10^), they were removed and the structural equations for the affected endogenous variables were rerun again. The results were again examined and one additional path was found to have turned insignificant

Table 10. Summary of Structural Equations for Trim Model 2

Beta Weights (Standardized Parameter Estimates) for Second Over-Identified Recursive System

VARIABLES	DEPENDENT VARIABLES									
	4	5	6	7	8	9	10	11	12	13
1. Consumer Price	.41**	=.31**	.26**		.33**				.27**	.16**
2. Institut Size	.70**			=.38**	.21**	.23**	.13^		.43**	=.24**
3. Stud't Ability	.27**	=.33**			.14*	=.32**	.14*	.20**		.23**
4. Total Revenues			.20**	.36**			.22**	.16**	=.15*	.24**
5. At-Risk Stud't				=.20**		.26**	=.15*		.10^	=.32**
6. % Faculty PhD										
7. % F-T Faculty										=.14**
8. Enrich Prgrm										.12**
9. Remedial Prgrm										
10. Activity Prgrm										.11*
11. Stud't Housing										=.08*
12. Stud't Service										
13. Educt Progress										
R-square	.7175	.3619	.1927	.2305	.2619	.2202	.2289	.0972	.1388	.5926
Adjusted R-square	.7154	.3586	.1886	.2247	.2562	.2142	.2210	.0926	.1300	.5831
Error Variance	.2825	.6381	.8073	.7695	.7381	.7798	.7711	.9028	.8612	.4074

^p < 0.10, *p < 0.05, **p < 0.01
N = 396

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(Student Ability to #10 Activity Programs at .12^). This path was then removed and the corresponding structural equations were re-run one last time. After this, all paths were found to meet the criteria ($p \leq 0.05$) for retention. These procedures produced the final **Trimmed Empirical Model**. The results are summarized in Table 11.

This **Trimmed Empirical Model** thus represents the primary effects of the significant factors for institutional effectiveness. A comparison of the **Trimmed Empirical Model** with the **General Empirical Model** (Table 12) reveals that, although 10 predictor variables for **Educational Progress** have been eliminated, the overall model R-square has been reduced by only 0.0150 points (from .6076 to .5926), and Adjusted R-square has been reduced by only 0.0044 points (from .5875 to .5831), indicating that the fully trimmed model captures the essential elements required to explain a significant amount of the variation in Educational Progress. A comparison of the **Trimmed Empirical Model** with the **Reduced Empirical Model** similarly reveals only a minor reduction in R-square of 0.0100 points even though the **Trimmed Empirical Model** has 3 fewer predictors and 21 fewer paths.

The beta weights from the summary table for the **Trimmed Empirical Model**, together with the correlation coefficients for the three exogenous variables, were then used to construct a path diagram of the model. The standardized direct effects of each precursor variable on each successor variable can be easily seen in the path diagram presented in Figure 7. These direct effects provide considerable information about the structural factors underlying institutional characteristics and performance, and these factors and their relationships are discussed next.

Table 11. Summary of Structural Equations for the Trimmed Empirical Model

Beta Weights (Standardized Parameter Estimates)
for the Third and Final Over-Identified Recursive System

VARIABLES	DEPENDENT VARIABLES									
	4	5	6	7	8	9	10	11	12	13
1. Consumer Price	.41**	-.31**	.26**		.33**				.23**	.16**
2. Institut Size	.70**			-.38**	.21**	.23**			.45**	-.24**
3. Stud't Ability	.27**	-.33**			.14*	-.32**		.20**		.23**
4. Total Revenues			.20**	.36**			.34**	.16**	-.17*	.24**
5. At-Risk Stud't				-.20**		.26**	-.16**			-.32**
6. % Faculty PhD										-.14**
7. % F-T Faculty										.12**
8. Enrich Prgrm										
9. Remedial Prgrm										.11*
10. Activity Prgrm										-.08*
11. Stud't Housing										
12. Stud't Service										
13. Educt Progress										
R-square	.7175	.3619	.1927	.2305	.2619	.2202	.2167	.0972	.1322	.5926
Adjusted R-square	.7154	.3586	.1886	.2247	.2562	.2142	.2127	.0926	.1255	.5831
Error Variance	.2825	.6381	.8073	.7695	.7381	.7798	.7833	.9028	.8678	.4074

^p < 0.10, *p < 0.05, **p < 0.01,
N = 396

Table 12. Comparisons of the General, Reduced, and Trimmed Models

VARIABLES	General Model (N=392)	Reduced Model (N=396)	Trimmed Model (N=396)
Consumer Price	.12*	.14**	.16**
Student Ability	.20*	.21**	.23**
Institutional Size	-0.22*	-0.24**	-0.24**
Total Revenues	.22*	.23**	.24**
At-Risk Students	-0.31*	-0.30**	-0.32**
Percent Faculty Ph.D.	.08*	.07^	
Percent F-T Faculty	-0.11*	-0.13**	-0.14**
Faculty/Student Ratio	.02		
Enrichment Programs	.10*	.11**	.12**
Remedial Programs	-0.07^	-0.07^	
Library Books	-0.01		
Library Journals	.01		
Curricular Diversity	.02		
Activity Programs	.09^	.11*	.11*
Athletic Programs	.05		
Athletic Facilities	-0.04		
Student Housing	-0.09*	-0.08*	-0.08*
Student Services	.07^	.07^	
ROTC Programs	-0.05		
R-square	.6076	.6026	.5926
Adjusted R-square	.5875	.5902	.5831
Error Variance	.3924	.3974	.4074

One interesting finding from an analysis of these direct effects is that **Consumer Price** (at .26**) still demonstrates a direct effect on **Percent Faculty Ph.D.** even after controlling for **Total Revenues** (at .20**). This is quite unexpected since one might think that the direct effect of **Consumer Price** on faculty quality would be subsumed in the effect of **Total Revenues** and become insignificant like the direct effect of **Institutional Size**.[38] There are at least three possible explanations for what was found instead. First, it may be that faculty, like students, are also judging institutional quality on the basis of price. Second, the path from **Consumer Price** to **Percent Faculty Ph.D.** may indicate that the revenue from tuition is going primarily to faculty salaries and that the nontuition portion of **Total Revenues** is going to everything else. Third, it may be due to some combination of the first two.

However, analyses using only direct effects may be misleading, and they do not take advantage of the analytical power provided by path analysis. The advantage of causal modeling and path analysis over typical regression analysis is in the extra explanatory power provided by analysis of direct, indirect, and total effects. For example, the total effect is an important indicator in path models particularly where the indirect positive and negative effects from the same variable cancel each other out.

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[38]As indicated by the results from the **Reduced Empirical Model** presented earlier, **Institutional Size** has a negative direct effect (-0.11) on **Percent Faculty Ph.D.** However, that **Institutional Size** path, along with one from **At-Risk Students** (which had a negative direct effect of -0.03), and one from **Student Ability** (which has a positive direct effect of .09), were dropped from the **Trimmed Empirical Model** because they weren't significant. While large size did have a negative impact on faculty quality, the significant impact of large size comes from its indirect and interactive effect with charges for tuition. The path diagram for the **Reduced Empirical Model** reveals that the indirect effect of **Institutional Size** on **Percent Faculty Ph.D.** as expressed through **Total Revenues** is .175 (putting the total effect of **Institutional Size** on **Percent Faculty Ph.D.** at .065). That is, the revenues from tuition times enrollment would constitute a large percentage of total revenues, with total revenues primarily determining faculty salaries, which then would, in turn, affect faculty quality as represented by the percentage with doctorates.

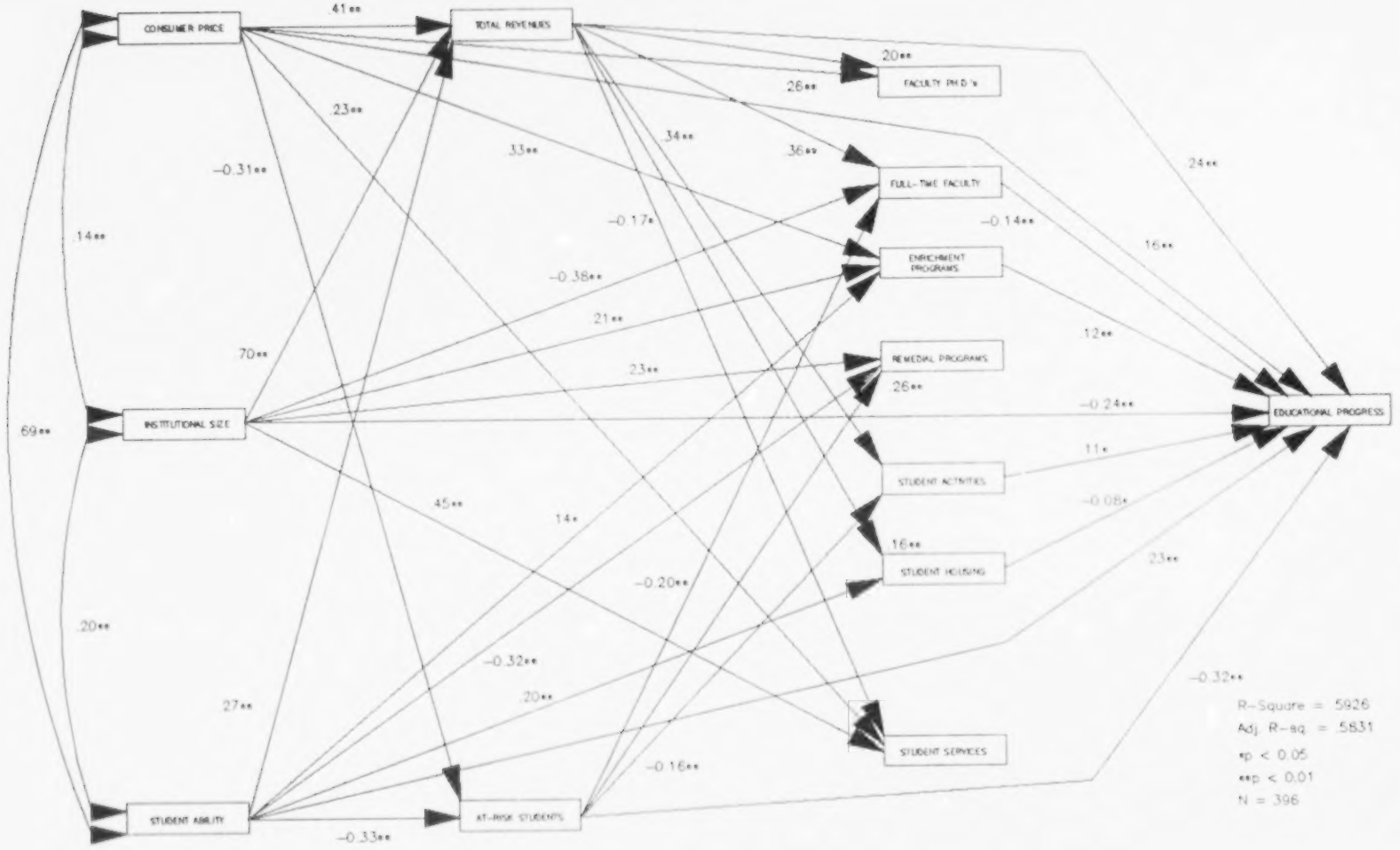

Figure 7. Path Diagram of the Trimmed Empirical Model

To aid further analysis and interpretation of the **Trimmed Empirical Model**, a final path diagram was constructed using only those variables with direct paths to **Educational Progress** (thus eliminating the **Percent Faculty Ph.D.**, **Remedial Programs**, and **Student Services** variables and the eight paths leading to them). By eliminating such "dead-end" variables, the primary empirical determinates of **Educational Progress** can be clearly represented, and the indirect and total effects of these significant factors can be readily calculated. The final diagram is presented in Figure 8.

As can be seen in Table 13, once the indirect effects of an independent variable (as expressed through any intervening variables) are taken into account, the total effect of that variable may be quite different than its unmediated direct causal effect.

Table 13. Direct, Indirect, and Total Effects for Final Model

VARIABLE	10. Educational Progress		
	DIRECT EFFECT	INDIRECT EFFECT	TOTAL EFFECT
1. Consumer Price	.16**	.22	.38
2. Institutional Size	-0.24**	.23	-0.01
3. Student Ability	.23**	.16	.39
4. Total Revenues	.24**	-0.02	.22
5. At-Risk Students	-0.32**	.01	-0.31
6. Percent F-T Faculty	-0.14**		-0.14
7. Enrichment Programs	.12**		.12
8. Activity Programs	.11*		.11
9. Student Housing	-0.08*		-0.08

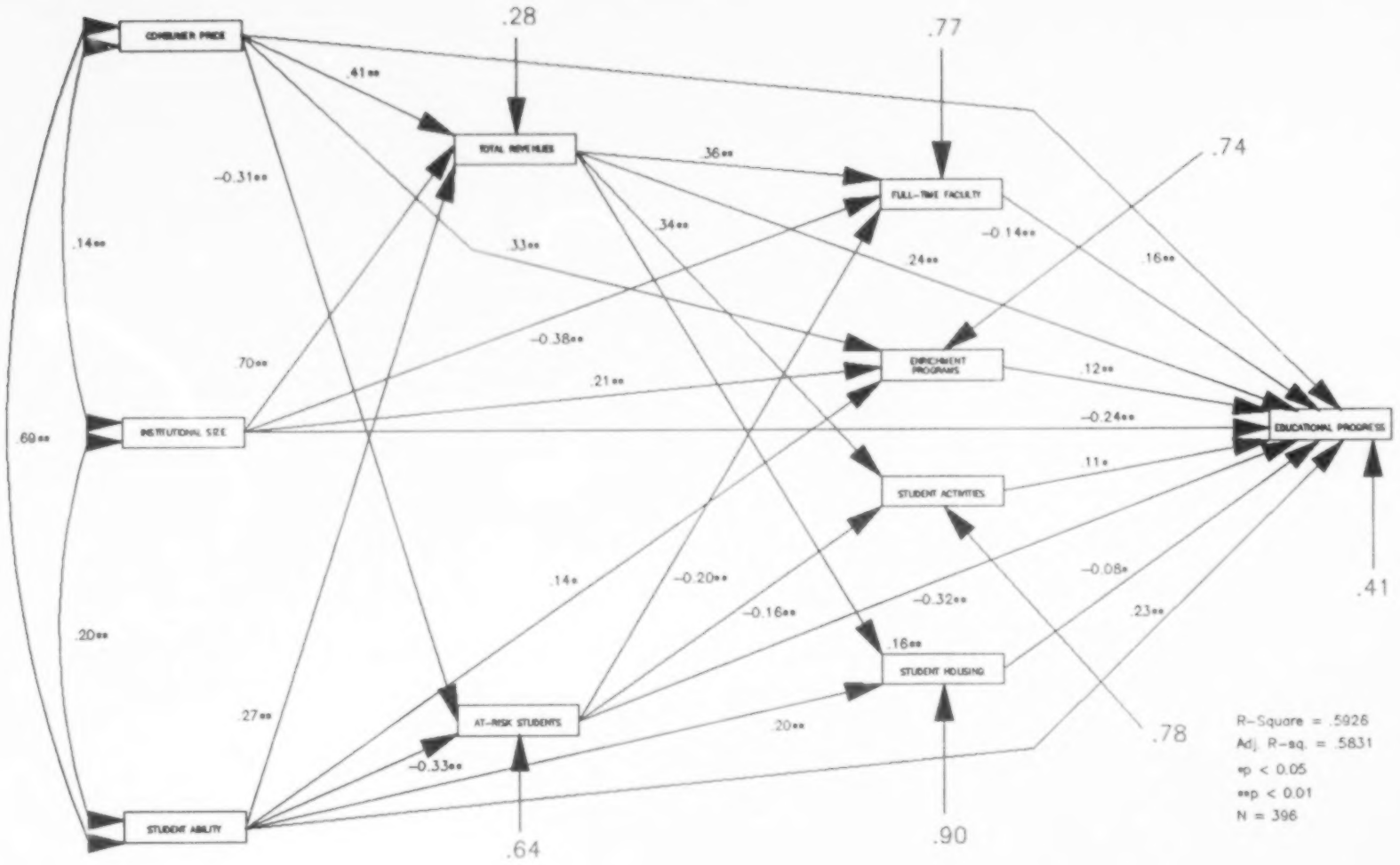

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Figure 8. Path Diagram of the Final Model

The differences between direct and total effects are best illustrated by the paths from **Institutional Size** to **Educational Progress**. The direct effect of **Institutional Size** is strongly negative (-0.24**) and, in fact, it is the second strongest of the nine variables (along with **Total Revenues** at a positive .24). Much of the past research and literature on student persistence and retention has focused on the negative impact that larger institutional size has on student academic progress. However, when financial variables are added to the study and indirect effects are examined, quite a different picture emerges. As can be seen in the path diagram and in Table 13 above, the -0.24** negative direct effect of **Institutional Size** is almost completely offset by the .23 sum of its indirect effects. This is largely due to the mediating influence of increased revenues, which larger size generally brings (the sum of the indirect effects through **Total Revenues** is .15). When indirect effects are considered, the total effect of **Institutional Size** is only -0.01 making it the variable with the smallest total effect!

Analysis of the Final Model. In this final set of analyses, the direct, indirect, and total effects of the exogenous and endogenous variables on **Educational Progress** will be examined.

The effects of the price charged for tuition and fees (**Consumer Price**) on institutional quality was the first issue raised in this study. The **Final Model** presented above and the calculation of effects provide further insight into this question. As can be seen, **Consumer Price** has a direct, positive, and significant effect on **Educational Progress** of .16** even after controlling for the effects of all other variables in the model. The higher charges for tuition and fees at the higher priced institutions, independently from any other cause, contribute by themselves to student retention and degree completion. This would seem to support the

hypothesized workings of Festinger's cognitive dissonance theory in student educational achievement. That is, not only do many students seem to judge institutional quality on the basis of price, but the very payment of that price apparently represents a psychological investment and commitment to the institution. The higher the price, the stronger the commitment must be (in order for the student not to feel that he has made the mistake of a bad investment).

Consumer Price also has a number of indirect effects on **Educational Progress**. The strongest effects are expressed through the mediating influence of **At-Risk Students**. Unfortunately, the higher the price for tuition, the fewer at-risk students an institution has. Of course, having fewer such students almost automatically assures that an institution will have better results on retention and graduation measures. The indirect effect of **Consumer Price** through **At-Risk Students** (computed at P 5,1 = -0.31** times P 10,5 = -0.32) is 0.10 and displays this phenomenon.[39] Additional indirect effects of **Consumer Price** through **At-Risk Students** are expressed through **Percent Full-Time Faculty** and **Activity Programs**.

The influence of **Consumer Price** is also expressed indirectly through the mediating effects of **Total Revenues**. The path P 4,1 = .41** (**Consumer Price** to **Total Revenues**) together with the path P 10,4 = .24** (**Total Revenues** to **Educational Progress**) produces an indirect effect of 0.10, which when added to the other indirect paths from **Consumer Price**, as mediated through **Total Revenues**, sums to an indirect effect of 0.09 (the reduction from

[39]The notation P 5,1 = -0.31** is standard shorthand used in path analysis. The P stands for path. The first number is the number assigned to the dependent variable and the second number represents the number assigned to the independent variable. The numbers for the variables come, in this case, from the table of direct, indirect, and total effects calculated from the final path diagram. Therefore, in this example, the notation represents the path to **At-Risk Students** (variable #5) from **Consumer Price** (#1), which has a path coefficient of -0.31 at the 0.01 level of significance.

.10 to .09 is due to the direct negative effects of **Percent Full-Time Faculty** and **Student Housing** on **Educational Progress**).

Consumer Price also transmits its influence on **Educational Progress** indirectly through its direct effect on **Enrichment Programs**, which in turn has a direct positive effect on **Educational Progress** (computed as P 7,1 at .33** times P 10,7 at .12** totaling to .04). As discussed in an earlier analysis of the **Reduced Empirical Model**, the fact that a direct effect from **Consumer Price** to **Enrichment Programs** remains even after controlling for **Total Revenues** may indicate that student tuition dollars more directly support such programs than do revenues from other sources. That this may be so is reinforced by the fact that, in the **Final Model**, no significant path remains from **Total Revenues** to **Enrichment Programs**. However, since direct paths remain from all three exogenous variables, it may be that high-ability consumers demand or select large, high-cost institutions in part precisely because they offer more enrichment programs, and institutions respond to such market pressures in kind.

Altogether, then, the indirect effects of **Consumer Price** sum to .22 making the total effects come to .38, and this means that **Consumer Price** is the second strongest factor for **Educational Progress** of the nine independent variables in the model (up from fifth when only direct effects were considered). This analysis indicates that **Consumer Price** not only makes a direct contribution to **Educational Progress** but that it also is a determining factor in the environmental structures suggested by the literature and the conceptual model, and that through these structures it has an additional indirect effect on **Educational Progress**.

Institutional Size was shown above to have direct and indirect effects that almost cancel each other out. The negative direct effects of large institutional size are offset by positive indirect effects, such as increased revenues and the programs and services such

revenues provide. Offsetting positive indirect effects from **Institutional Size** are also expressed through the mediation of **Enrichment Programs** and **Percent Full-Time Faculty.**

Institutional Size has a direct positive effect on **Enrichment Programs** (P 7,2 = .21**), which, in turn, has a positive, direct effect on student retention and degree completion (P 10,7 = .12**). The product of these two paths produces an indirect effect of .03 for **Institutional Size** to **Educational Progress** through **Enrichment Programs**. That is, larger institutional size is a factor in having a greater number of enrichment programs, which, in turn, is a positive factor for institutional effectiveness.

Institutional Size also has a negative direct effect (P 6,2 = -0.38**) on **Percent Full-Time Faculty**, which, in turn, has a negative direct effect (P 10,6 = -0.14**) on **Educational Progress**. The product of these two paths is .05, which gives the indirect effect of **Institutional Size** on **Educational Progress** through **Percent Full-Time Faculty**. That is, as enrollments go up, the percentage of full-time faculty goes down (and the percentage of part-time faculty increases), which, in turn, produces an increase in student progress. This double negative is curious. The fact that larger size would result in more part-time faculty is not surprising, but the fact that more part-time faculty improves student retention and graduation rates runs contrary to accepted wisdom on the subject. Perhaps part-time faculty provide more student contact time, or, to the degree that there is a faculty research culture propagated by full-time faculty, perhaps part-time faculty devote more time to classroom teaching activities, which would have a positive effect on retention.

The path diagram also shows that **Institutional Size** has both a negative direct effect on **Percent Full-Time Faculty** and a positive indirect effect through **Total Revenues**. In this case, apparently the positive effects from the extra revenues that greater student numbers

bring (P 4,2 = .70** times P 6,4 = .36** produces a product of .25) is more than offset by the direct negative effects of larger size (P 6,2 = -0.38**) as shown by a total effect of **Institutional Size** on **Percent Full-Time Faculty** of -0.13 (from the sum of .25 and -0.38).

Student Ability, as might be expected, exerts the strongest total influence on **Educational Progress**. It has a direct effect of .23** and indirect effects summing to .16 (yielding total effects of .39) primarily through the mediation of **At-Risk Students**. Both tuition charges (**Consumer Price**) and institutional selectivity (as represented by **Student Ability**) have a negative effect on the percentage of at-risk students enrolled at an institution (**At-Risk Students**), as can be seen by coefficients for P 5,1 = -0.31** and P 5,3 = -0.33** respectively. In turn, the lower the percentage of at-risk students an institution has, the higher its performance on student retention and graduation rates (**Educational Progress**), as represented, in part, by P 10,5 = -0.32**. Other indirect effects expressed through **At-Risk Students** go through **Percent Full-Time Faculty** and **Activity Programs**. All of these sum to a total of .10 for the indirect effects of **Student Ability** on **Educational Progress** through **At-Risk Students**.

Student Ability also has a curious direct effect on **Total Revenues**. Although **Consumer Price** and **Student Ability** are strongly correlated, a direct effect of .27** (P 4,3) for **Student Ability** on **Total Revenues** remains, net of the effect of **Consumer Price** on **Total Revenues**. One possible explanation for this is that highly selective institutions are able to generate greater nontuition revenues (perhaps from more successful alumni or from corporate inclinations to make larger donations to those institutions perceived to be of higher quality, such as those having higher average student test scores). **Student Ability** thus transmits additional influence on **Educational Progress** (at .06 overall) indirectly through its

direct effect on **Total Revenues**. The influence of **Total Revenues** on **Educational Progress** has been discussed somewhat above. It is worth noting that the indirect effects from **Total Revenues** as expressed through the four remaining environmental variables are quite weak (summing to only -0.02) due to the fact that the positive indirect effects through **Activity Programs** (.04) are cancelled out by the negative indirect effects through **Percent Full-Time Faculty** (at -0.05) and **Student Housing** (at -0.01). However, **Total Revenues** exerts a direct, positive effect on **Educational Progress** (P 10,4 = .24**). This is not surprising. Greater institutional revenues would enable greater expenditures, which would presumably result in a better academic and social environment and, thus, greater student persistence. The fact that a direct effect remains after controlling for the effects of the other variables in the model suggests that the influence of money is expressed through other factors not represented by the model (perhaps through such things as the quality of the physical plant as, for example, the beauty of the campus buildings and grounds, the richness of the interior furnishing, and the presence of desired facilities and amenities). As a side comment, it is worth noting that **Consumer Price**, **Institutional Size**, and **Student Ability** explain 72 percent of the variation in **Total Revenues** for the universe of private, general baccalaureate institutions, something institutional policymakers might want to keep in mind.

The indirect effects of **At-Risk Students** are also weak (they sum to only .01). The positive indirect effect of **At-Risk Students** through **Percent Full-Time Faculty** (.03) is offset by the negative indirect effect through **Activity Programs** (at -0.02). **At-Risk Students** exerts a negative effect on the percentage of **Percent Full-Time Faculty**, which turns out to be good for **Educational Progress** (due to the negative influence of **Percent Full-Time Faculty** on **Educational Progress**). On the other hand, the greater the percentage of **At-Risk Students**

at an institution, the fewer are the number of **Activity Programs** provided. This results in a negative overall effect on **Educational Progress**.

However, **At-Risk Students** exerts its strongest influence directly on **Educational Progress** (P 10,5 = -0.32**). In fact, the direct path from **At-Risk Students** is the most robust of all the direct effects on **Educational Progress**. The most important finding here is that **At-Risk Students** exerts this influence even after controlling for student ability. This would seem to indicate that at-risk students are not necessarily at risk just because they are underprepared. Older, part-time, and minority students show less educational progress even when their ability level is the same as traditional students. This suggests that institutional environment factors and external factors (such as family responsibilities) may play an important role in retention and graduation rates for these students. Such a conclusion is consistent with previous research by Astin and others, and it has implications for both institutional administrators and students falling into at-risk categories.

The remaining variables, coming last in the model, only have direct effects on **Educational Progress**. **Percent Full-Time Faculty** (at -0.14**), as has been shown, has a negative effect on **Educational Progress** (or, to turn it around, the percentage of part-time faculty has a positive direct effect). **Enrichment Programs**, on the other hand, has a positive effect on **Educational Progress** (at .12**). For its part, the number of **Enrichment Programs** is determined by the positive influence of **Consumer Price**, **Institutional Size**, and **Student Ability**. The number of student activity programs (**Activity Programs**) also has a positive effect on student retention and graduation rates (at .11*). Lastly, **Student Housing** has a negative influence on **Educational Progress** (at -0.08*). This finding is interesting for a couple of reasons. It appears that variety in the types of student housing available at an

institution is seen as a desirable characteristic (as evidenced by the fact that institutions with higher revenues provide more types of housing) or as a "reward" to students for being bright (as evidenced by the fact that more selective institutions provide greater housing variety even after controlling for total institutional revenues). The thinking may be that brighter students can handle fraternity and sorority housing situations, off-campus apartments, and coed dorms. However, the finding that housing variety has a negative influence on **Educational Progress** and mediates somewhat the strong positive effect of **Student Ability** (the indirect effect of **Student Ability** through **Student Housing** is -0.02) may lead to some rethinking on this issue even though the effect is small.

Turning now to the final variable, the ultimate dependent variable **Educational Progress**, the path diagram of the **Final Model** reveals that 59 percent of the variation in **Educational Progress** is explained by the independent variables in the model for the 396 private, general baccalaureate institutions used in this part of the analysis. This would seem to indicate that the model does a fairly good job of capturing the key structural elements underlying institutional effectiveness as defined in this study.

CHAPTER V
DISCUSSION

Introduction

To better understand the importance and ramifications of the present study, it may be worthwhile to first revisit briefly the past. Past research on the effectiveness of higher education has often suffered from one or more difficulties related to oversimplification or lack of a complete model of the educational process. Some studies have focused only on the inputs of educational costs or student ability, while others have focused only on student-related outputs such as the lifetime earnings of college graduates or number of degrees produced. Still other research projects have been concerned only with faculty productivity, or have limited their analysis to methods of improving efficiency in circumscribed areas of college operations such as energy use. The few studies that have attempted to measure institutional quality have been plagued by difficulties with defining and measuring quality, and have often confused inputs with outputs. And, although a few studies have examined inputs and outputs together in order to measure institutional efficiencies or to analyze the institutional effect on student outcomes, only a small number of them have attempted to explain differences in productivity between institutions with similar missions and levels of selectivity.

The primary shortcoming of studies to date is that they have lacked an interdisciplinary perspective combining both economic and environmental impact approaches. The current study, therefore, started in a new direction. It used a comprehensive

conceptual framework that took into account inputs and outputs, and which combined the perspectives of both economic and environmental approaches.

In addition to using a combined conceptual approach, the current study departed from past studies in several ways. First, it included costs as a factor in retention and graduation rates, an important consideration overlooked in many studies. Second, the study is institution rather than student based. This study focuses on the organization as the unit of analysis rather than on the student, which for the past decade has usually been the case. Much of past thinking has also focused on what the student can do to adapt to the institution. This study highlights the importance of knowing what institutions can do to adapt to students. In this study, the institutional environment structures themselves were not posited to differ on the basis of student characteristics. Rather, student characteristics were hypothesized to affect the choice of the actual type of institution a student attended.

Discussion of the Findings

The stated purpose of this study was to provide an empirical critique to two unquestioned assumptions, or "myths," operating in American higher education. The first myth is that the quality of a college can be judged on the basis of its price. The second is that colleges have a positive, "value-added" impact on their students. These two assumptions are at the very heart of student college choice decisions and the raison d'etre for our nation's educational institutions. And while the relationships between price and quality, and the collegiate effect on student outcomes are quite complex, in short, the myths that introduced this study have proven to be true. And false.

The analyses conducted for this study have identified 19 key structural and environmental characteristics that together explain over 60 percent of institutional effectiveness as measured by student educational progress at the universe of 593 private, general baccalaureate institutions in the United States. In general, academic enrichment programs and student activities seem to be the most important positive factors after controlling for student characteristics and ability. However, the analyses suggest that, to be most effective, institutions need to recognize that high-ability and low-ability students require different environments and programmatic approaches. Interestingly, for those who enroll in 4-year private liberal arts colleges, it also appears that price itself, as represented by the tuition and fees students pay, not only reflects a student's psychological commitment to an institution, but actually adds to it. Apparently, the very act of paying a high tuition bill increases a student's chance of graduating.

The results also indicate that while, in general, consumers can indeed judge an institutions's quality by its price, that there are wide ranges of performance in each price category. That is, while most higher priced colleges do better than most lower priced institutions, some low-cost colleges outperform even the most expensive schools. The analyses also suggest that there are some differences by institutional size. It appears that a combination of small size and low institutional endowments requires some colleges to charge students overly high prices in order to remain competitive, and that many such overly priced colleges still aren't able to deliver an effective level of services.

Lastly, the results point to several ways that college administrators and policymakers can realign programs and reallocate resources to raise performance levels and reduce costs. Primary among them is the development and articulation of a clear vision of the institutional

mission. Knowing what business the institution is in (that is, research or teaching) and who its clients are (for example, graduate school-bound overachievers or disadvantaged students seeking a better life) provides institutional leaders with the reference points necessary for making critical decisions about such things as program diversity, the allocation of resources, and assessment criteria. Mission statements that embody a working consensus of institutional purpose rather than banal treaties between warring factions become the basis for strategic plans and operational action. A clear vision of an institution's purpose can allow its various constituencies to accept a future orientation that realizes that "less is more" in some cases, that a concentrated focus can be more effective than a broad sweep, and that growth by substitution can be an viable alternative to growth by accretion. Adoption of such a view can help break what Massy (1989, p. 11) calls the "add-on spiral," which is the continued layering of program on program and cost on cost.

Discussion of the Study

Importance of the Study

A study that calls for strategic reductions which are mission and student type specific is not exactly radical. However, the fact that the call is based on strong empirical evidence does give it some weight worth considering.

Answering the Calls for Accountability. This project was important for two primary reasons. First, a study of this nature makes a contribution toward answering the calls for accountability in higher education. With college costs rising faster than inflation, with a college education being one of biggest and most important investments in a person's life,

and with federal programs providing an estimated $18.5 billion in general student aid,[40] it was important to do a national study in order to provide some much-needed information on the relationships between price and educational outcomes.

The need for studies that explore both the input (tuition) and output (educational outcomes) sides of the educational enterprise was one of the major concerns expressed at a meeting of the Washington-based higher education associations.[41] It is not enough to focus on costs alone, for without some measures of quality and some standard indicators of educational outcomes, it is not known whether high costs imply inefficiency.[42]

Institutional Practice. This project was also important for a second reason related to institutional practice. Since the structural theory of institutional environments advanced in this study posits that the causal elements of student outcomes are largely the result of conscious institutional decisions, this study has important implications for campus policymakers. The specific institutional elements identified as being determinates of or detriments to desired student outcomes can be modified, augmented, or otherwise taken into consideration as an institution aligns its policies and resources toward fulfilling its mission. In short, the emphasis of this study was on things under administrative or faculty control: things that can be changed, not inexplicable phenomena.

Astin (1974, p. 26) describes the educational decisionmaking process as involving choices "among the available alternative means by which the desired objectives may be

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[40]For the 1988-89 academic year (U.S. Department of Education, Office of Postsecondary Education, unpublished data).

[41]Sponsored by the American Council on Education, May 13, 1987, Washington, D.C.

[42]From testimony by Chester E. Finn, Jr., Assistant Secretary of Education, before the House Subcommittee on Postsecondary Education, September 15, 1987.

achieved." One way to conceptualize the "structures" referred to in this study would be to view them as the results of decisions made when choosing between means of achieving desired ends. Means become structures when such decisions are made formally or repeatedly, such that the results become "institutionalized." The conscious choices regarding, for example, optimal class size, preferred faculty qualifications, type of student housing, the number of library holdings, or the diversity of student services to be provided become the underlying structures, unique to each institution, which influence the achievement of ultimate educational objectives.

Contribution to Research Methodology. On a less grand scale, this study has made a modest contribution to educational research in two ways. First, it has demonstrated that a large number of theory-based environmental attributes and institutional characteristics can be operationalized. Second and more importantly, it has adequately specified a causal model of effectiveness and, in so doing, overcome many of the conceptual complexities that have plagued much of the research on productivity in higher education. Third, it has broken new ground by taking, and showing the importance of taking, a multi-disciplinary approach to questions of institutional quality and effectiveness, and to studies of student persistence and graduation rates.

Implications for the Future

The results of this study provide a framework for discussion, action, and further research on the problem of institutional costs and quality. This study also provides some useful findings for improving institutional practice, for family decisions about college attendance and costs, and information to guide policymakers as they deal with questions about accountability in higher education.

Consumer Decisions. The importance of the study's findings is clear. Since it has been determined that higher prices are indeed strongly associated with greater quality as it was defined in the study (even after controlling for student ability), students, parents, and policymakers are generally justified in judging institutional quality on the basis of price, and high-priced colleges can more easily defend their tuition levels. Furthermore, since it has been demonstrated that higher prices result in richer collegiate environments, which in turn translate into greater institutional effectiveness toward achieving desired student outcomes, consumers can begin to get a sense of the net value of the educational dollar.

On the other hand, it has also been shown that within each performance quartile there is a wide range of institutional prices. In short, while you do get what you pay for, it also pays to shop around. What this means is that consumers can not be confident that the higher prices at one particular institution as compared to another, or at the same institution from one year to the next, represent real differences in institutional quality as opposed to operational inefficiencies, marketing strategies, or reallocation of resources for some nonoutcomes-related goal.

Future Research and Quality Standards. While this study indicated the general relationships between costs and quality, it did not produce a "cost accounting" of specific educational products nor attempt to place a price tag on educational value. However, if the cost of quality could be specifically determined, or if it could be demonstrated that a certain amount of cost produced a particular level of quality, then consumers, institutions, and policymakers could judge the relative tradeoffs between costs and quality from one institution to the next or evaluate the productivity of one state system of higher education against another. The public would then be better able to make informed decisions about

educational support levels. A long-range result of such research might be the establishment of industrywide standards of quality for each cost level, which would provide direct measures for institutional accountability and the determination of reasonable public subsidies. Such standards might eventually help institutions get out of the current spiral of spending to attract students--spending that seems to emphasize meeting consumer tastes rather than pedagogical imperatives.

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